43e Année 34e Volume

BULLETIN

DE LA

SOCIÉTÉ FOUAD Ier D'ENTOMOLOGIE

anciennement :
Société Entomologique d'Egypte (1907-1921)
et *Société Royale Entomologique d'Egypte* (1922-1937)

FONDÉE LE 1er AOUT 1907

PLACÉE SOUS LE HAUT PATRONAGE DU GOUVERNEMENT EGYPTIEN
PAR DÉCRET ROYAL EN DATE DU 15 MAI 1923

LE CAIRE

IMPRIMERIE PAUL BARBEY

1950

SOCIÉTÉ FOUAD Ier D'ENTOMOLOGIE

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SOCIÉTÉ FOUAD Ier D'ENTOMOLOGIE

QUARANTE-TROISIÈME ANNÉE

TRENTE-QUATRIÈME VOLUME

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Date de parution et de distribution du présent Volume :
31 Décembre 1950.

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A. ALFIERI

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SOCIÉTÉ FOUAD Ier D'ENTOMOLOGIE

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1950 CHOPARD (Lucien), Maître de Recherches au Centre National de la Recherche Scientifique, Museum National d'Histoire Naturelle, 45 bis, Rue de Buffon, Paris (Ve), France.

1924 EBNER (Prof. Richard), 3, Beethovengasse, Vienne (IX), Autriche.

1950 HALL (Dr. W.J.), Director of the Commonwealth Institute of Entomology, 41, Queen's Gate, Londres, S.W. 7, Angleterre.

1950 JEANNEL (Prof. Dr. René), Directeur du Museum National d'Histoire Naturelle, Laboratoire d'Entomologie, 45 bis, Rue de Buffon, Paris (Ve), France.

1950 MARSHALL (Sir Guy), 31, Melton Court, Onslow Crescent, Londres, S.W. 7, Angleterre.

1950 MUNRO (Prof. Dr. J.W.), Imperial College of Science and Technology, Field Station, Silwood Park, Sunninghill, Berks, Angleterre.

1950 NEAVE (Dr. S.A.), Mill Green Park, Ingatestone, Essex, Angleterre.

1929 PEYERIMHOFF DE FONTENELLE (P. de), 87, Boulevard Saint-Saëns, Alger, Algérie.

1908 PIC (Maurice), Les Guerreaux, par Saint-Agnan (Saône-et-Loire), France.

1950 SNODGRASS (R.E.), Bureau of Entomology, United States Department of Agriculture, Washington, D.C., Etats-Unis d'Amérique.

1943 UVAROV (Dr. B.P.), Director Anti-Locust Research Centre, British Museum (Natural History), Cromwell Road, Londres, S.W. 7, Angleterre.

1950 WIGGLESWORTH (Dr. V.D.), Zoological Laboratory, Downing Street, Cambridge, Angleterre.

F WILLCOCKS (F.C.), « Brambles », Hurst Lane, Sadlescombe (near Battle), Sussex, Angleterre.

1950 WILLIAMS (Dr. C.B.), Rothamsted Experimental Station, Harpenden, Herts, Angleterre.

Membres Correspondants

1932 ALFKEN (J.D.), 18, Delmestrasse, Brême, Allemagne.

1950 BALACHOWSKY (A.), Chef du Service de Parasitologie Végétale, Institut Pasteur, 25, Rue du Docteur Roux, Paris (XV^e), France.

1950 BOURSIN (Ch.), 11, Rue des Ecoles, Paris (V^e), France.

(1950) F CHAROUR (Edgard), Pension Erlanger, 10, Rue Erlanger, Paris (XVI^e), France.

1950 CHINA (W.E.), British Museum (Natural History), Cromwell Road, Londres, S.W. 7, Angleterre.

1924 HINDLE (Prof. Dr. Edward), Zoological Society of London, Regent's Park, London, N.W. 8, Angleterre.

1925 KIRKPATRICK (Thomas Winfrid), The Imperial College of Tropical Agriculture, Trinidad, British West Indies.

1934 KOCH (C.), Eaton Hall, Visagie Street, Prétoria, Afrique du Sud.

1929 MASI (L.), Museo Civico di Storia Naturale « Giacomo Doria », 9, Via Brigata Liguria, Genova (102), Italie.

1950 RICHARDS (Dr. O.W.), Imperial College of Science and Technology, Prince Consort Road, Londres, S.W. 7, Angleterre.

1950 SÉGUY (E.), Laboratoire d'Entomologie, Museum National d'Histoire Naturelle, 45 bis, Rue de Buffon, Paris (V^e), France.

1950 THORPE (Dr. W.H.), Department of Zoology, University of Cambridge, Downing Street, Cambridge, Angleterre.

1950 VAYSSIÈRE (P.), Professeur d'Entomologie Agricole Coloniale, Museum National d'Histoire Naturelle, 57, Rue Cuvier, Paris (V^e), France.

Membres Titulaires

1913 ABAZA Pacha (S.E. Fouad), Directeur Général de la Société Royale d'Agriculture, Boîte Postale N° 63, au Caire.

1944 ABD EL-MALEK (Dr. Albert A.), Conférencier au Département d'Entomologie, Faculté des Sciences, Université Fouad Ier, Abbassieh, au Caire.

1949 AFIFI (Afifi Mahmoud), Démonstrateur au Département d'Entomologie, Faculté des Sciences, Université Fouad Ier, Abbassieh, au Caire.

1950 AHMED (Moustafa), 5, Sharia Haroun, Orman, Ghizeh.

1908 ALFIERI (Anastase), Secrétaire Général et Conservateur de la Société Fouad Ier d'Entomologie, Boîte Postale N° 430, au Caire.

1941 AMIN EL-DIB (Abdel-Latif), Faculté d'Agriculture, Université Farouk Ier, Chatby, Alexandrie.

1938 ATTIA (Rizk), Section d'Entomologie, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

1945 AZAB (Dr. Ahmed Kamel), Département d'Entomologie, Faculté d'Agriculture, Université Fouad Ier, Sharia El-Madares, Ghizeh, près le Caire.

1950 BADAWI (Aly Ibrahim), Démonstrateur au Département d'Entomologie, Faculté d'Agriculture, Université Ibrahim Pacha El-Kébir, Chebin El-Kom (Menoufieh), Basse-Egypte.

1938 BAILEY BROS. AND SWINFEN LTD., Minerva House, 26-27, Hatton Garden, Londres, E.C. 1, Angleterre.

1950 BAKER (Captain D.B.), 21, Quarry Road Park, Cheam, Sutton, Surrey, Angleterre.

1929 BICHARA (Ibrahim), Section d'Entomologie, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

1946 BIGIO (Henri), Embassy Court, 11, Sharia Gabalaya, Ghézireh, au Caire.

1923 BODENHEIMER (Prof. F.S.), Hebrew University, Jerusalem, Palestine.

1938 CARNERI (Alexandre), 9, Sharia Ebn El-Farred, Attarine, Alexandrie.

1929 CASSAB (Antoine), Section d'Entomologie, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

1950 CHARKAWI (Zaki Aly), Inspectorat du Ministère de l'Agriculture, Assouan (Haute-Egypte).

1931 COMPAGNIE UNIVERSELLE DU CANAL MARITIME DE SUEZ (Monsieur l'Agent Supérieur de la), 20, Sharia Dar El-Chefa, Kasr El-Doubara, Boîte Postale N° 2120, au Caire.

1944 Coyne (Dr. F.P.), c/o Imperial Chemical Industries Ltd. (General Chemistry Division), Pest Control Section. Randle, Astmoor, Runcom, Cheshire, Angleterre.

1934 Crédit Foncier Egyptien (Monsieur l'Administrateur-Délégué), 35, Sharia Abd El-Khalek Saroit Pacha, au Caire.

1944 Daira Draneht Pacha, Sarawella, par Kafr-Dawar (Béhéra), Basse-Egypte.

1948 Daoud (Hanna), Section d'Entomologie, Ministère de l'Agriculture, Dokki, (Ghizeh), près le Caire.

1938 Directorate-General of Agriculture, Ministry of Economics, Baghdad, Irak.

1928 Dollfus (Robert Ph.), Directeur de Laboratoire et de Recherches, Museum National d'Histoire Naturelle, 57, Rue Cuvier, Paris (Vme), France.

1919 Efflatoun Bey (Prof. Hassan C.), Doyen et Professeur d'Entomologie, Faculté des Sciences, Université Fouad Ier, 16, Sharia Hoda Chaarawi, au Caire.

1946 El-Khishen (Dr. Shafik Aly), Faculté d'Agriculture, Université Farouk Ier, Chatby, Alexandrie.

1950 El-Naggar (Aly Abd El-Maksoud), Conseiller Technique de « The Near East Chemical and Fumigation C° (Amin Tewfik Bey and C°), 11, Sharia Soliman Pacha, Boîte Postale No. 66, au Caire.

1948 El-Ziady (Mademoiselle Samira), Département d'Entomologie. Bey and C°), 11, Sharia Soliman Pacha, Boîte Postale N° 66, au Caire.

1947 Ezz (Ahmed Ibrahim), Section d'Entomologie, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

1947 Ezzat (Yehia Mahmoud), Section d'Entomologie, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

1944 Faculté d'Agriculture (Bibliothèque de la), Université Farouk Ier, Chatby, Alexandrie.

1934 Faculté d'Agriculture, Université Fouad Ier, Sharia El-Madares, Ghizeh, près le Caire.

1946 Faculté de Médecine (Bibliothèque de la), Université Farouk Ier, Alexandrie.

1949 Flaschentraeger (Dr. Bonifaz), Professeur de Chimie Biologique, Faculté des Sciences, Université Farouk Ier, Moharrem Bey, Alexandrie.

1948 Frangopoulos (Aristide Mikhali), Ingénieur Agronome, Borg Gianaclis, Abou Matamir (Béhéra), Basse-Egypte.

1950 Frey (Georg), 60, Osterwaldstrasse, Munich 23, Allemagne.

1950 Gad (Dr. Amin M.), Entomologiste, 8, Sharia El-Amir Tusun, Zamalek, au Caire.

1914 Garboua (Maurice), 1, Midan Soliman Pacha, au Caire.

1938 Ghabn (Dr. Abd El-Aziz), Section d'Entomologie, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

1927 Ghali Pacha (S.E. Wacef Boutros), 35, Sharia El-Ghizeh, Ghizeh, près le Caire.

1938 Ghesquière (J.), 87, Avenue du Castel, Bruxelles (W. St L.), Belgique.

1921 Greiss (Elhamy), Professeur-adjoint de Botanique, Faculté des Sciences de l'Université Fouad Ier, 215, Sharia El-Malika, au Caire.

1942 Habib (Abdallah), Conférencier en Entomologie à la Faculté d'Agriculture, Université Ibrahim Pacha El-Kébir, Chebin El-Kom (Menoufieh), Basse-Egypte.

1936 Hafez (Dr. Mahmoud), Professeur-Adjoint d'Entomologie, Faculté des Sciences, Université Fouad Ier, Abbassieh, au Caire.

1944 Hafez (Moustafa), Laboratoire des Insectes Parasites, Cotton Research Board, Ghizeh (Orman), près le Caire.

1948 Haines (Prof. R. Wheeler), Hôpital Demerdache, Sharia El-Malika (Abbassieh), au Caire.

1938 Hamza (Soliman), Section d'Entomologie, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

1938 Hanna (Dr. Assaad Daoud), c/o Pest Control Ltd., Bourn, Cambridge, Angleterre.

1944 Hassan (Dr. Abbas Ibrahim), Département de Zoologie, Faculté des Sciences, Université Fouad Ier (Ghizeh, Orman), 80, Sharia Saleh El-Din, Héliopolis, près le Caire.

1945 Hassan (Dr. Ahmed Abd El-Gawad), Section d'Entomologie, Faculté d'Agriculture, Université Farouk Ier, Chatby, Alexandrie.

1928 Hassan (Dr. Ahmed Salem), Professeur de Zoologie et d'Entomologie à la Faculté d'Agriculture, Université Fouad Ier, Sharia El-Madares, Ghizeh, près le Caire.

1944 Hassan (Mahrus Saleh), Section d'Entomologie, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

1940 Hifnaoui Pacha (S.E. le Prof. Mahmoud Tewfik), Conseiller Technique du Ministère de l'Agriculture et Président de la Société Fouad Ier d'Entomologie, Organisation des Nations Unies (Substances alimentaires et agricoles), Immeuble Isis, 7, Sharia Liazogli, Kasr El-Doubara, au Caire.

1949 Hoare (Geoffrey S.), c/o Turf Club, 19, Sharia Adly Pacha, au Caire.

1927 Housny (Mahmoud), Section d'Entomologie, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

1950 Housny (Salama Mohamed), Démonstrateur au Département d'Entomologie, Faculté d'Agriculture, Université Fouad Ier, Sharia El-Madares, Ghizeh, près le Caire.

1943 Hussein (Mohamed), Section d'Entomologie, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

1938 Ibrahim (Abd El-Hamid Ibrahim), Section d'Entomologie, Ministère de l'Agriculture, Dokki (Guizeh), près le Caire.

1940 Ibrahim (Ahmed Housny), Section d'Entomologie, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

1948 Ibrahim (Mohamed Mahmoud), Laboratoire des Insectes Parasites, Cotton Research Board, Ghizeh (Orman), près le Caire.

1944 Imperial Chemical Industries (Egypt), S.A., 15, Midan Mohamed Aly, P.O. Bag, Alexandrie.

1936 Imperial Chemical Industries (Egypt), S.A., 26, Sharia Chérif Pacha, P.O.Bag, au Caire.

1950 Issa (Gamal Ibrahim), Démonstrateur à la Faculté d'Agriculture, Université Ibrahim Pacha El-Kébir, Chebin El-Kom (Menoufia), Basse-Egypte.

1928 Izzet Bey (Mohamed), 14, Midan El-Daher, au Caire.

1927 Kamal Bey (Dr. Mohamed), Professeur d'Entomologie à la Faculté des Sciences, Université Farouk Ier (Moharrem Bey), 7, Sharia Saïd Pacha, Gianaclis, Ramleh, Alexandrie.

1922 Kaourk (Elias A.), Avocat, c/o Egyptian Markets Company Ltd, 14, Sharia Mohamed Farid Bey (ex Emad El-Dine), au Caire.

1943 Kefl (Ahmed Hassanein El-), Démonstrateur au Département d'Entomologie, Faculté d'Agriculture, Université Fouad Ier, Sharia El-Madares, Ghizeh, près le Caire.

1949 Keimer (Dr. Louis), Professeur d'Egyptologie à la Faculté des Lettres, Université Fouad Ier, 17, Sharia Youssef El-Guindi, au Caire.

1950 Khalifa (Dr. Abd El-Fattah), Conférencier à la Faculté d'Agriculture, Université Ibrahim Pacha El-Kébir, Chebin El-Kom (Menoufia), Basse-Egypte.

1938 Klein (Dr. H.Z.), Agricultural Research Station, Boîte Postale N° 15, Rehovoth, Palestine.

1923 Laboratoires d'Hygiène Publique (Bibliothèque), Sharia El-Sultan Hussein, au Caire.

1931 Land Bank of Egypt (Monsieur l'Administrateur-Directeur), Boîte Postale N° 614, Alexandrie.

1944 Lean (Owen Bevan), Old Forge Cottage, Winkfield, Windsor, Angleterre.

1950 Le Gros (Armand Eugène), HQ. R.E. Stores Establishment, Melf. 15, Fanara.

1923 Librarian (The), Research Division Library, Ministry of Agriculture, Wad Medani, Soudan.

1931 Lycées Français (Monsieur le Proviseur), 2-4, Sharia Youssef El-Guindi, au Caire.

1948 Macri (Dr. Giuseppe), 12, Sharia Nouzha, Héliopolis, près le Caire.

1932 Madwar Bey (Dr. Saadallah Mohamed), Directeur Général du Département des Maladies Endémiques, Ministère de l'Hygiène Publique, Sharia El-Falaki, au Caire.

1948 Maher Aly (Abd El-Meneim), University College London, London University, Londres, W.C. I, Angleterre.

1927 Mansour (Prof. Dr. Kamel), D. Sc., Doyen de la Faculté des Sciences, Université Ibrahim Pacha El-Kébir, Ghizeh (Orman), près le Caire.

1947 Meymarian (Albert T.), Directorate of Agriculture, Baghdad, Iraq.

1921 Mistikawy (Abd El-Megid El-), Société Royale d'Agriculture, Boîte Postale N° 63, au Caire.

1945 Moazzo (Polychronis Georges), 2, Sharia Young, Alexandrie.

1926 Mohamed (Kassem), Section d'Entomologie, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

1944 Morcos (Dr. Georges), Gezira Research Farm, Wad Medani, Soudan.

1929 Mosseri (Dr. Henri), 25, Sharia Talaat Harb Pacha, au Caire.

1944 Moursi (Dr. Abd El-Fattah Aly), Attaché Agricole, c/o Ambassade d'Égypte, Washington, Etats-Unis.

1943 Nakhla (Naguib), Assistant Technique, Section d'Entomologie, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

1950 Near East Chemical and Fumigation C° (The) (Amin Tewfik Bey and C°), 2, Sharia Toussoun Pacha, Boîte Postale N° 527, Alexandrie.

1942 Okbi (Mahmoud Ismail El-), Section d'Entomologie, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

1944 Palmoni (J.), Beth Gordon, Dagania A, P.O. Kinneret, Palestine.

1939 Pantos (Jean G.), Ingénieur Agronome, Boîte Postale N° 1074, Elisabethville, Congo Belge.

1944 Planta & C° (J.), Boîte Postale N° 450, Alexandrie.

1928 Priesner (Prof. Dr. H.), Expert Entomologiste, Section d'Entomologie, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

1942 Rawhy (Soheil Hussein), Section d'Entomologie, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

1932 Rivnay (E.), P.O.Box 91, Rehovoth, Palestine.

1943 Rizkallah (Ramses), Assistant Technique, Section d'Entomologie, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

1925 Royal Entomological Society of London (The), 41, Queen's Gate, South Kensington, Londres, S.W. 7, Angleterre.

1948 Sabet Frères & Co. (Les Fils de D. Sabet), 9, Sharia Mohamed Farid Bey (ex Emad El-Dine), Boîte Postale N° 966, au Caire.

1943 Samak (Mohamed Mohamed), Assistant Technique, Section d'Entomologie, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

1950 Samhane (Moustafa), Assistant Technique, Section d'Entomologie, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

1941 Sawaf (Saleh Kamel El-), Département d'Entomologie, Faculté d'Agriculture, Université Farouk I^er^, Chatby, Alexandrie.

1936 Sayed (Dr. Mohamed Taher El-), Professeur d'Entomologie, Faculté des Sciences, Université Ibrahim Pacha El-Kébir, Ghizeh (Orman), près le Caire.

1938 Shafik Bey (Dr. Mohamed), Directeur Technique de la Société Financière et Industrielle d'Egypte, Boîte Postale N° 7, Kafr-Zayat, Basse-Egypte.

1950 Shalaby (Abd El-Salam), Démonstrateur au Département d'Entomologie, Faculté des Sciences, Université Farouk I^er^, Moharrem Bey, Alexandrie.

1948 Shalaby (Fathy), Section d'Entomologie, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

1938 Société du Naphte, S.A. (A.I. Mantacheff & Co.), Emara El-Shams, 2, Midan Kasr El-Doubara, au Caire.

1921 Société Royale d'Agriculture, Laboratoire d'Entomologie de la Section Technique, Boîte Postale N° 63, au Caire.

1934 Soliman Bey (Prof. Dr. Hamed Seleem), Doyen de la Faculté d'Agriculture, Université Fouad I^er^, Sharia El-Madares, Ghizeh, près le Caire.

1928 Soliman (Dr. Labib Boutros), Section d'Entomologie, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

1950 Stower (W.J.), Desert Locust Survey, c/o Department of Agriculture, B.A.E., Asmara, Erythrée.

1950 Sullam and Co. (Florio), 5, Sharia El-Hadiah, Kasr El-Doubara, Boîte Postale N° 793, au Caire.

1946 Taher (Mahmoud), Section d'Entomologie, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

1926 Tewfik (Mohamed), Chef de Laboratoire et Conservateur des collections entomologiques de la Faculté des Sciences, Université Fouad Ier, Abbassieh, au Caire.

1950 Tolba (Mohamed Kamel Abd El-Megid), Conférencier en Entomologie, Faculté des Sciences, Université Ibrahim Pacha El Kébir, Ghizeh (Orman), 75, Sharia Manial, au Caire.

1935 Tractor and Engineering Company, S.A.E. (The), 18, Sharia Mohamed Farid Bey (ex Emad El-Dine), Boîte Postale N° 366, au Caire.

1945 Triantaphyllidis (Nicolas P.), Assistant technique, Bureau de l'Attaché Agricole, Embassade d'Amérique, Athènes, Grèce.

1947 Waterston (A.R.), Entomologiste Conseil du B.M.E.O., 10, Sharia Tolumbat, Garden City, au Caire.

1912 Wilkinson (Richard), Immeuble Baehler, 157, Sharia Fouad Ier, Zamalek, au Caire (Ouest).

1947 Wiltshire (E.P.), c/o Consulat Britannique, Shiraz, Iran.

1946 Zaazou (Dr. Hussein), Département d'Entomologie, Faculté d'Agriculture, Université Farouk Ier, Chatby, Alexandrie.

1950 Zahar (A.R.), Chef du Service du Contrôle des Mouches, Section d'Eradication des Insectes, Sharia El-Falaki, Ministère de l'Hygiène Publique, au Caire.

1948 Zaki (Mademoiselle Malaka), Département d'Entomologie, Faculté des Sciences, Université Fouad Ier, Abbassieh, au Caire.

1943 Zaki (Mikhaïl), Section d'Entomologie, Musée Agricole Fouad Ier, Dokki (Ghizeh), près le Caire.

1944 Zervudachi (Laky), Boîte Postale N° 1277, Alexandrie.

1938 Zoheiry Bey (Mohamed Soliman El-), Directeur-Général du Département de Protection des Plantes, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

Envois divers

Bibliothèque du Cabinet de Sa Majesté le Roi, Palais d'Abdine, au Caire.

Bibliothèque privée de SA MAJESTÉ LE ROI (Monsieur le Conservateur de la), Palais de Koubbeh, près le Caire.

Son Excellence le Ministre de l'Agriculture, Dokki (Ghizeh), près le Caire.

Son Excellence le Président de la Cour des Comptes, au Caire.

Son Excellence le Président du Conseil d'Administration de la Société Royale d'Agriculture, Boîte Postale N° 63, au Caire.

Monsieur l'Administrateur-Délégué du Crédit Foncier Egyptien, 35, Sharia Abdel Khalek Saroit Pacha, au Caire.

Son Excellence le Président du Conseil d'Administration de la Banque Misr, 151, Sharia Mohamed Farid Bey (ex Emad El-Dine), au Caire.

Monsieur le Directeur Général de l'Imperial Chemical Industries (Egypt), 26, Sharia Chérif Pacha, au Caire.

Monsieur le Directeur Général de la Société Financière et Industrielle d'Egypte, 2, Sharia Fouad I^er^, Alexandrie.

Son Excellence le Sous-Secrétaire d'Etat, Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

Son Excellence le Secrétaire-Général du Ministère de l'Agriculture, Dokki (Ghizeh), près le Caire.

Son Excellence l'Administrateur Général de la Khassa Royale, Palais d'Abdine, au Caire.

Bibliothèque de l'Institut Fouad I^er^ du Désert, c/o Son Excellence l'Administrateur Général de la Khassa Royale, Palais d'Abdine, au Caire.

Bibliothèque Egyptienne, Midan Bab El-Khalq, au Caire.

Bibliothèque du Musée Agricole Fouad I^er^, Dokki (Ghizeh), près le Caire.

Nature, Macmillan and Co. Ltd., St. Martin's Street, London, W.C. 2. Angleterre.

Commission Internationale des Industries Agricoles, 18, Avenue de Villars, Paris (VII^e^), France.

Unesco, Middle-East Science Cooperation Office, 8, Sharia El-Salamlik, Garden City, au Caire.

Echanges

Afrique Occidentale Française

Institut Français d'Afrique Noire, Boîte Postale N° 206, Dakar.

Afrique du Sud

South African Museum (The), P.O. Box 61, Cape Town.

Department of Agriculture of the Union of South Africa (The Agricultural Journal of the Union of South Africa), Pretoria.

Department of Agriculture of the Union of South Africa, Division of Entomology, P.O. Box 513, Pretoria.

The Director, The Transvaal Museum, P.O. Box 413, Pretoria.

Algérie

Société d'Histoire Naturelle de l'Afrique du Nord, c/o Monsieur L. Faurel, Laboratoire de Botanique, Faculté des Sciences d'Alger, Alger.

Office National Anti-Acridien, Institut Agricole d'Algérie, Maison-Carrée, Alger.

Allemagne

Deutsche Entomologische Gesellschaft, 43, Invalidenstrasse, Berlin (IV).

Senckenbergische Naturforschende Gesellschaft (Bibliothek), Senckenberg-Anlage 25, Frankfurt am Main.

Bücherei des Zoologischen Museums, 43. Invalidenstrasse, Berlin N 4.

Gesellschaft für Vorratsschutz E.V. (Mitteilungen der), 31, Zimmermannstrasse, Berlin-Steglitz.

Bücherei der Biologischen Anstalt für Land- und Forstwirtschaft, 19, Königin-Luise-Str., Berlin-Dahlem.

Deutsches Entomologisches Institut (Arbeiten über morphologische und taxonomische Entomologie, Arbeiten über physiologische und angewandte Entomologie), 1, Waldowstrasse, Berlin-Friedrischhagen.

Museum für Natur-, Völker- und Handelskunde, Bahnhofsplatz, Brême.

Naturhistorischer Verein der Rheinlande und Westfalens (Entomologische Blätter, Decheniana), 41, Bennauerstrasse, Bonn (22c).

Zoologische Sammlung des Bayerischen Staates, Münchner Entomologischen Gesellschaft E.V. (Mitteilungen der), 67, Menzingerstrasse, Zone Américaine, Munich 38.

Angleterre

The Commonwealth Institute of Entomology, Publication Office and Library (Review of Applied Entomology), 41, Queen's Gate, Londres, S.W. 7.

Zoological Museum (Novitates Zoologicæ), Tring Park, Tring, Herts.

The Secretary, The Apis Club (The Bee World), The Way's End, Foxton, Royston, Herts.

Cambridge Philosophical Society, New Museums, Free School Lane, Cambridge.

The Director, Anti-Locust Research Centre, British Museum (Natural History), Londres, S.W. 7.

The Librarian, The Zoological Society of London, Regent's Park, Londres, N.W. 8.

The Librarian, Department of Entomology, University Museum, Oxford.

Argentine

Instituto Biologico de la Sociedad Rural Argentina, Buenos Aires.

Sociedad Cientifica Argentina, 11.45, Calle Santa Fé, Buenos Aires.

Sociedad Entomologica Argentina, 267, Calle Maipu, Buenos Aires.

Museo Argentino de Ciencias Naturales « Bernadino Rivadavia », e Instituto Nacional de Investigacion de las Ciencias Naturales, 470, Avenida Angel Gallardo, Buenos Aires.

Revista y Notas del Museo de la Plata (Zoologia), Facultad de Ciencias Naturales y Museo de la Plata (Biblioteca), La Plata.

Ministerio de Agricultura (Boletin del Ministerio de Agricultura de la Nacion), Bibliotheca, 974, Paseo Colon, Buenos Aires.

Instituto Miguel Lillo, Universidad National de Tucuman, Calle Miguel Lillo N° 205, Tucuman.

Asociacion Argentina de Artropodologia, Lacar 3722, Buenos Aires.

Australie

The Australian Museum (The Librarian), Sydney, N.S.W.

The Entomologist's Office, Department of Agriculture, Sydney, N.S.W.

The Public Library, Museum, and Art Gallery of South Australia (The South Australian Museum), Box 386 A, G.P.O., Adelaide, South Australia.

The Library, Divisions of Plant Industry and Entomology, P.O. Box N° 109, Canberra City, A.C.T.

The Linnean Society of New South Wales, Science House, Gloucester and Essex Streets, Sydney, N.S.W.

Waite Agricultural Research Institute, Private Mail Bag, Adelaide, South Australia.

Autriche

Administration-Kanzlei des Naturhistorischen Museums, Burgring 7, Vienne (I).

Zoologisch-Botanische Gesellschaft (Sekretariat), Burgring 7, Vienne (I).

Koleopterologische Rundschau, c/o Zoologisch-Botanische Gesellschaft. 2, Mechelgasse, Vienne (III).

Belgique

Société Entomologique de Belgique, Musée Royal d'Histoire Naturelle de Belgique, 31, Rue Vautier, Bruxelles, 4.

Société Scientifique de Bruxelles, Secrétariat, 11, Rue des Récollets, Louvain.

Bulletin de l'Institut Agronomique et des Stations de Recherches de Gembloux, Bibliothèque de l'Institut Agronomique de l'Etat, Gembloux.

Lambillionea, Revue Mensuelle Belge d'Entomologie, c/o M. Lucien Berger, 2, Vallée des Artistes, Linkebeek, Bruxelles.

Annales du Musée du Congo Belge, Tervuren.

Annales de Gembloux (Revue des Ingénieurs Agronomes de Gembloux), c/o Monsieur Réné Georlette, 207, Avenue Richard Neyberg, Bruxelles 2.

Brésil

Museu National, Quinta da Boa Vista, Rio de Janeiro.

Instituto Biologico, Bibliotheca, Caixa 119-A, São Paulo.

Instituto Oswaldo Cruz, Caixa de Correio 926, Rio de Janeiro.

Arquivos do Serviço Florestal, 1008, Jardim Botânico, Rio de Janeiro

Academia Brasileira de Ciencias (Anais da Academia Brasileira de Ciencias), Caixa Postal 229, Rio de Janeiro.

Faculdada Nacional de Filosofia, 40, Avenida Presidente Antonio Carlos, Rio de Janeiro.

« Dusenia », publicatio de scientia naturali, c/o Monsieur Ralph J.G. Hertel, Av. Vicente Machado, 1446, Curitiba, Parana.

Bulgarie

Institutions Royales d'Histoire Naturelle, Musée Royal d'Histoire Naturelle, Palais Royal, Sofia.

Société Entomologique de Bulgarie, Musée Royal d'Histoire Naturelle, Palais Royal, Sofia.

Société Bulgare des Sciences Naturelles, Musée Royal d'Histoire Naturelle, Palais Royal, Sofia.

Canada

Entomological Division, Science Service Building, Department of Agriculture, Ottawa, Ontario.

Bibliothèque du Ministère Fédéral de l'Agriculture, Edifice de la Confédération, Ottawa.

Entomological Society of Ontario (The Canadian Entomologist, and Reports), Guelph, Ontario.

Nova Scotian Institute of Science, Halifax.

Chine

The Lingnan Science Journal, Lingnan University, Canton.

Bulletin of the Biological Department, Science College, National Sun Yat-Sen University, Canton.

Bureau of Entomology of the Chekiang Province, West Lake, Hangchow.

Chypre

The Cyprus Agricultural Journal (The Office of the Government Entomologist), Nicosia.

Colombie (République de), Amérique du Sud

Facultad Nacional de Agronomia (Biblioteca de la), Medellin.

Cuba

Sociedad Cubana de Historia Natural « Felipe Poey » (Memorias) c/o Dr. Carlos Guillermo Agnayo, 25 N° 254, Vedado, La Havane.

Danemark

Entomologisk Forening, Zoologisk Museum, Krystalgade, Copenhague

Egypte

Ministère de l'Agriculture, Bibliothèque de la Section d'Entomologie, Dokki (Ghizeh), près le Caire.

Société Royale d'Agriculture, Bibliothèque de la Section Technique, Boîte Postale N° 63. au Caire.

Union des Agriculteurs d'Egypte, 25, Sharia Talaat Harb Pacha, au Caire.

Académie Egyptienne des Sciences (Monsieur le Secrétaire Honoraire de l'), Dar El-Hikma, 42, Sharia El-Kasr El-Aïni, au Caire.

Feuilles Agricoles, c/o Lycée Français, Chatby, Alexandrie.

Al-Fellaha, Boîte Postale N° 2047, au Caire.

Société Royale de Géographie d'Egypte, Bureau Postal de Kasr El-Doubara, au Caire.

The Journal of the Royal Egyptian Medical Association, Kasr El-Aini Post Office, au Caire.

Société Fouad Ier d'Economie Politique, de Statistique et de Législation. Boîte Postale N° 732, au Caire.

Institut d'Egypte, 13, Sharia El-Sultan Hussein, au Caire.

Bibliothèque de la Faculté des Sciences, Université Fouad Ier, Abbassieh, au Caire.

The Royal Oceanographic Institute, Ghardaqua (Red Sea).

Equateur (République de l'), Amérique du Sud

Director General de Agricultura (Revista del Departamento de Agricultura), Quito.

Boletin de la Seccion Agricola del Banco Hipotecario del Ecuador, Apartado 685, Quito.

Espagne

Instituto Nacional de 2ª Ensenanza de Valencia, Laboratorio de Hidrobiologia Espanola, Valencia.

Junta para ampliacion de Estudios e Investigaciones Cientificas, 4, Duque de Medinaceli, Madrid.

Eos, Revista Espanola de Entomologia, Instituto Espanol de Entomologia, Hipodromo, Madrid (VI).

Real Academia de Ciencias y Artes, 9, Rambla de los Estudios, Barcelona (II).

Real Sociedad Espanola de Historia Natural (Biblioteca), Palacio de Bellas Artes, 84, Avenida del Generalisimo, Madrid.

Estacion de Fitopatologia Agricola, 15, Miguel Angel, Madrid.

Instituto de Ciencias Naturales, Museo Municipal de Ciencias Naturales, Apartado de Correos 593, Barcelone.

Etats-Unis

The Research Library, Buffalo Society of Natural Sciences, Buffalo Museum of Science, Humboldt Park, Buffalo, New-York.

University of Illinois Library, Exchange Division, Urbana, Illinois.

The Library, American Museum of Natural History, Central Park West at 79th Street, New-York City.

Gifts and Exchanges Librarian-OJS, The Ohio State University (The Ohio Journal of Science), Colombus 10, Ohio.

California Academy of Science Library (Pan-Pacific Entomologist), Golden Gate Park, San Francisco, 18, California.

Academy of Natural Sciences, Entomological Section, Lagon Square, Philadelphia.

Experiment Station of the Hawaiian Sugar Planters' Association, P.O. Box 411, Honolulu, T.H., Hawaii.

Hawaiian Entomological Society (The Secretary), 1527, Keeaumoku Street, Honolulu 4, Hawaii.

Carnegie Museum, Department of the Carnegie Institute, Pittsburgh, Pennsylvania.

American Entomological Society (The), 1900, Race Street, Philadelphia, 3, Pennsylvania.

United States National Museum, c/o Smithsonian Institution, Washington 25, D.C.

General Library, University of Michigan, Ann Arbor, Michigan.

United States National Museum, c/o Smithsonian Institution, Washington 25, D.C.

Smithsonian Institution Library, Washington 25, D.C.

New-York State College of Agriculture (The Library), Cornell University, Ithaca, New-York.

New-York Academy of Sciences, New-York.

University of California (The Library), College of Agriculture, Agricultural Experiment Station, Berkeley 4, California.

University of California, Citrus Experimental Station Library, Riverside, California.

Wisconsin Academy of Sciences, Arts, and Letters, Room 120, Wisconsin State Historical Building, Madison, Wisconsin.

The Library, Minnesota Agricultural Experiment Station, University Farm, Saint Paul, Minnesota.

Museum of Comparative Zoology, Harward College, Cambridge, Mass.

The Philippine Agriculturist (The Library of the College of Agriculture), Agricultural College, Laguna, Philippine Islands.

The Wasmann Collector (The Managing Director), Department of Biology, University of San Francisco, San Francisco 17, California.

The Reading Public Museum and Art Gallery (The Librarian), Reading, PA.

Editorial Office, The American Midland Naturalist, University of Notre Dame, Notre Dame, Indiana.

Marine Biological Laboratory (The Library), Woods Hole, Mass.

The Library, State College of Washington, Agricultural Experiment Station, Pullman, Washington.

Finlande

Societas Entomologica Helsingforsiensis (Notulae Entomologicae), Museum Zoologicum, Helsingfors.

Societas pro Fauna et Flora Fennica, Kaserngatan 24, Helsinki.

Societas Zoologica-Botanica Fennica Vanamo, Säätytalo, Snellmaninkatu 9-11, Helsinki.

Société Entomologique de Finlande (Annales Entomologici Fennici), Institut de Zoologie Agricole et Forestière de l'Université, Snellmaninkatu 5, III kerr., Helsinki.

France

L'Echange (Revue Linnéenne), Les Guerreaux, par Saint-Agnan (Saône et Loire).

Revue française d'Entomologie, Museum National d'Histoire Naturelle (Entomologie), 45 bis, Rue de Buffon, Paris (V^e).

Revue Scientifique du Bourbonnais et du Centre de la France, 22, Avenue Meunier, Moulins (Allier).

Société d'Etudes des Sciences Naturelles de Nîmes, 6, Quai de la Fontaine, Nîmes (Gard).

Société de Pathologie Végétale et d'Entomologie Agricole de France, Institut Pasteur, 25, Rue du Docteur Roux, Paris (XV^e).

Société Linnéenne de Bordeaux, Athénée, 53, Rue Des Trois Conils, Bordeaux.

Société Linnéenne de Lyon, 33, Rue Bossuet, Lyon (VI^e)

Société des Sciences Naturelles de l'Ouest de la France, 2, Rue Athénas, Nantes (Loire Inférieure).

Association des Naturalistes de Levallois-Perret, 153, Rue du Président Wilson (Domaine de la Planchette), Levallois-Perret (Seine).

Société Linnéenne du Nord de la France, 81, Rue Lemerchier (M. Pauchet), Amiens.

Société Géologique de Normandie et des Amis du Museum du Havre, Hôtel des Sociétés Savantes, 56, Rue Anatole France, Le Havre (Seine Inférieure).

Annales Scientifiques de Franche-Comté, 10, Rue de la Convention, Besançon (Doubs).

Société d'Histoire Naturelle de Toulouse (Monsieur P. Bonnet, Bibliothécaire de la), Faculté des Sciences, Toulouse.

Société Entomologique de France, Institut National Agronomique, 16, Rue Claude Bernard, Paris (V^e).

Société d'Etudes Scientifiques de l'Aude, Carcassone (Aude)

Annales des Epiphyties, Service de Documentation, Centre National de Recherches agronomiques, Route de Saint-Cyr, à Versailles (Seine et Oise).

Museum National d'Histoire Naturelle, Bibliothèque, 8, Rue de Buffon Paris (V^e).

Société de Zoologie Agricole (Revue de Zoologie Agricole et Appliquée), Faculté des Sciences, Institut de Zoologie, 40, Rue Lamartine, Talence (Gironde).

L'Entomologiste (Monsieur le Rédacteur en Chef de), Muséum National d'Histoire Naturelle, Entomologie, 45 bis, Rue de Buffon, Paris (V^e).

Rédaction du Bulletin Analytique, Service de Documentation du Centre National de la Recherche Scientifique, Ministère de l'Education Nationale, 45, Rue d'Ulm, Paris (V^e).

Institut des Fruits et Agrumes Coloniaux (Fruits d'Outre Mer), 6, Rue du Général Clergerie, Paris (XVI^e).

Grèce

Institut Phytopathologique Benaki, Kiphissia (près Athènes).

Bibliothèque de l'Institut et Musée Zoologique de l'Université, Athènes.

Hollande

Nederlandsche Entomologische Vereeniging (Bibliotheek van der Zeeburgerdijk. 21, Amsterdam (O).

Landbouwhoogeschool, Laboratorium voor Entomologie, Berg 37, Wageningen.

Hongrie

Természettudomanyi Muzeum, 13, Baross-utca, Budapest.

Indes

The Director, Zoological Survey of India (Records and Memoirs of the Indian Museum), 27, Chowringhee, Calcutta 13.

Madras Government Museum, Connemara Public Library, Egmore, Madras 8.

Office of the Director, Agricultural Research Institute, New Delhi.

The Honorary Secretary, Zoological Society of Bengal (Proceedings of the), 35, Ballygunge Circular Road, Calcutta 19.

Indonésie

Bibliotheca Bogoriensis, Centrale Natuurwetenschappelijke Bibliotheek, 20, Djalan Raya, Bogor, Java.

Iran

Laboratoires du Département Général des Recherches Agronomiques (Monsieur le Directeur), Ministère de l'Agriculture, Tehran.

Italie

Museo Civico di Storia Naturale « Giacomo Doria », 9, Via Brigata Liguria, Genova (102).

Rivista di Biologia Coloniale, 326, Viale Regina Margherita (Policlinico), Roma.

Museo Civico di Storia Naturale di Trieste (Atti del), 4, Piazza Hortis, Trieste (10).

Società dei Naturalisti in Napoli, Università di Napoli, Via Mezzocannone, Napoli.

Società Entomologica Italiana, Museo Civico di Storia Naturale, 9, Via Brigata Liguria, Genova (102).

Società Adriatica di Scienze Naturali, 7, Via dell'Annunziata, Trieste

La Stazione di Entomologia Agraria (Redia), 15-17, Via Romana, Firenze.

La Stazione Sperimentale di Gelsicoltura e Bachicoltura di Ascoli Piceno.

Istituto Zoologico dell'Università di Napoli (Biblioteca del), Via Mezzocannone, Napoli.

Laboratorio di Zoologia Generale e Agraria della Facolta Agraria, Portici (Napoli).

Ra. Laboratorio di Entomologia Agraria di Portici (Bolletino del), Portici (Napoli).

Institut International d'Agriculture (Bibliothèque de l'), Villa Umberto I, Rome.

Società Italiana di Scienze Naturali, Palazzo del Museo Civico di Storia Naturale, Corso Venezia, Milano.

Istituto di Zoologia dell'Università di Genova (Bolletino dei Musei di Zoologia e di Anatomia comparata), 5, Via Balbi, Genova.

Società dei Naturalisti e Matematici di Modena, presso l'Università, Modena.

Istituto di Entomologia dell'Università, 6, Via Filippo Re, Bologna (125).

Accademia di Scienze, Lettere ed Arti in Padova, 15, Via Accademia, Padova (Veneto).

Museo di Storia Naturale della Venezia Tridentina (« Memorie del Museo di Storia Naturale della Venezia Tridentina » e « Studi Trentini di Scienze Naturali »), Casella Postale 95, Trento.

Istituto Agronomico per l'Africa (Rivista di Agricoltura subtropicale e tropicale), Ministero dell'Africa, 13, Via Fibonacci, Firenze.

Istituto di Entomologia Agraria della Ra. Università (Bolletino di Zoologia Agraria e Bachicoltura), 2, Via Celoria, Milano.

Società Veneziana di Storia Naturale (presso Sig. Antonio Giordani Soika), S. Marco 254, Venezia.

Museo Civico di Storia Naturale, Verona.

Japon

Saghalien Central Experiment Station, Konuma, Saghalien.

The Ohara Institute for Agricultural Research, Library, Kurashiki, Oka yama-Ken.

Imperial Agricultural Experiment Station (Journal of the), Nishigahara Tokyo.

Department of Agriculture, Government Research Institute, Taihoku Formosa.

The Kansai Entomological Society, c/o N. Tosawa, Shibakawa-Noen, Kotoen, Mukogun, Hyogo-ken.

« Mushi », Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka.

Takeuchi Entomological Laboratory (Tenthredo, Acta Entomologica), Shinomyia Yamashina, Kyoto.

Kenya Colony (British East Africa).

East Africa Natural History Society (The Hon. Secretary), Coryndon Memorial Museum, P.O. Box 658, Nairobi.

Maroc

Société des Sciences Naturelles du Maroc, Institut Scientifique Chérifien. Avenue Biarnay, Rabat.

Service de la Défense des Végétaux (Monsieur le Chef du), 65 bis, Avenue de Témara, Rabat.

Mexique

Junta Nacional Directora de la Campana contra la Langosta (Junosta), Biblioteca, Departamento Directivo, Veracruz.

Biblioteca del Instituto Biotecnico, Calzada Mexico-Tacuba N° 295, Col. Anahuac, D.F.

Biblioteca del Instituto de Biologia, Chapultepec (Casa del Lago), Mexico, D.F.

Anales de la Escuela Nacional de Ciencias Biologicas, Apartado Postal 7016, Mexico, D.F.

Norvège

Tromso Museum Library, Tromso.

Panama (République de)

Departamento Seccional de Agricultura (Boletin Agricola), Panama.

Pologne

Musée Zoologique Polonais, ul. Wilcza N° 64, Varsovie.

Société Polonaise d'Entomologie (Bulletin Entomologique de la Pologne), ul. Sienkiewicza 21, Instytut Zoologiczny Uniwersytetu we Wroclawiu, Wroclaw.

Institut des Recherches Forestières (Bibliothèque), 52-54, Rue Wawelska, Varsovie (22).

Uniwersytet Marii Curie-Sklodowskiej, Biuro Wydawnictw, 5, Plac Litewski, Lublin.

Acta Musei Historiae Naturalis, Musée d'Histoire Naturelle, 17, Slawkowska, Cracovie.

Académie Polonaise des Sciences et des Lettres, 17, Rue Slawkowska, Cracovie.

Portugal

Société Portugaise des Sciences Naturelles (Bibliothèque de la), Institut de Botanique, Faculté des Sciences, Lisbonne.

Museum Zoologique de l'Université de Coimbra, Largo Marquês de Pombal, Coimbra.

Associaçao da Filosofia Natural (Bibliotecario da), Faculdade de Ciencias, Porto.

Instituto de Medicina Tropical (Monsieur le Directeur de l'), Lisbonne.

Conselho de Administraçao da Companhia de Diamantes de Angola, Lisbonne.

Roumanie

Société Transylvanienne des Sciences Naturelles (Siebenbürgischer Verein für Naturwissenschaften), Hermannstadt, Sibiu.

Academia Romana, Bibliothèque, Calea Victoriei, 125, Bucarest.

Russie (U.R.S.S.)

Société Entomologique de Russie (Revue d'Entomologie de l'U.R.S.S.), Musée Zoologique de l'Académie des Sciences, Léningrad.

Bibliothèque de l'Académie des Sciences de l'Ukraine, 58a. Rue Korolenko, Kiew (Ukraine).

Institut des Sciences Naturelles, Université M. Gorky, 1 ul. Genkelya, Zaimka, Molotov (Ourals).

The Lenin Academy of Agricultural Sciences, Institute for Plant Protection, 42, Herzen str., Leningrad.

Rédaction du Journal « Plant Protection », 7, Rue Tschaikovsky, Léningrad.

Institute for controlling Pests and Diseases, Library, 7, Rue Tschaikovsky, Léningrad 28.

Siam

Department of Agriculture and Fisheries, Entomology Section, Bangkok.

Suède

K. Swenska Vetenskapsakademien i Stockholm (Bibliotek), Stockholm 50

Entomologiska Föreningen (Bibliothèque de l'), Stockholm, 50.

Göteborgs Kungl. Vetenskaps-och Vitterhets Samhälles, Göteborg.

Statens Växtskyddsanstalt, Stockholm 19.

Bibliothèque de l'Université de Lund, Lund.

Suisse

Bibliothèque de la Société Entomologique Suisse, Musée d'Histoire Naturelle, Berne.

Tauschverkehr der Naturforschenden Gesellschaft, Zentralbibliothek Zähringerstrasse 6, Zurich I.

Tchécoslovaquie

Societas Entomologica Cechosloveniae (Casopis), Vinicna 7, Zoolog-Ustav-Csr., Prague II.

Museum National de Prague, Section de Zoologie (Sbornik Entomologického Oddeleni et Sbornik Narodniho Musea v Praze), Prague II, 1700.

Bibliothèque de la Société Zoologique Tchécoslovaque, Institut de Zoologie, Vinicna 7, Prague II.

Institut d'Entomologie Appliquée (Folia Entomologica), 1, Zemedelska, Brno.

Tunisie

Bulletin de la Société des Sciences Naturelles de Tunisie, 2, Rue de Souk-Ahras, Tunis.

Uruguay (République de l')

Escuela de Veterinaria del Uruguay (Anales de la Escuela de Veterinaria del Uruguay), Itazaingo 1461, Montévideo.

Sociedad de Biologia de Montevideo, Casilla de Correo 567, Montevideo.

Abonnements de la Société

Bulletin of Entomological Research, The Commonwealth Institute of Entomology, 41, Queen's Gate, S.W. 7, Londres, Angleterre.

Zoological Record (Insecta), The Commonwealth Institute of Entomology, 41, Queen's Gate, South Kensington, S.W.7, Londres, Angleterre

Proceedings and Transactions of the Royal Entomological Society of London, 41, Queen's Gate, South Kensington, Londres, S.W.7, Angleterre,

Journal of the Entomological Society of Southern Africa, The Honorary Secretary, P.O. Box 103, Prétoria, Afrique du Sud.

The Annals of Applied Biology, Cambridge University Press, Cambridge, Angleterre.

Parasitology, Cambridge University Press, Cambridge, Angleterre.

Transactions and Journals of the Society for British Entomology, c/o Dr. S C.S. Brown, 454, Christchurch Road, Bournemouth, Hants, Angleterre.

PROCÈS-VERBAUX DES RÉUNIONS

Réunion du Conseil du 15 Février 1950

Présidence de Monsieur le Professeur H.C. EFFLATOUN Bey, *Vice-Président.*

Nécrologie :

Nous avons le vif regret de faire connaître le décès de Monsieur EMMANUEL ZERVUDACHI, qui faisait partie de la Société depuis 1944.

Distinctions Honorifiques :

Nous avons le plaisir de faire savoir que notre Vice-Président, Monsieur le Professeur H.C. EFFLATOUN Bey, vient d'être nommé Doyen de la Faculté des Sciences de l'Université Fouad I^{er}, et que notre Vice-Président, Monsieur MOHAMMED SOLIMAN EL-ZOHEIRY Bey, a été promu Directeur Général du Département de Protection des Plantes au Ministère de l'Agriculture.

D'autre part, Monsieur le Professeur Docteur KAMEL MANSOUR, membre du Conseil de la Société, a été proclamé lauréat du Prix Farouk I^{er} 1950 pour les Sciences Naturelles, et Monsieur le Docteur MOHAMED KAMAL, Professeur d'Entomologie à la Faculté des Sciences de l'Université Farouk I^{er}, s'est vu octroyer le titre de Bey.

Le Conseil félicite tous ces distingués collègues.

Admission de Membres :

Sont admis à faire partie de la Société : Monsieur MOHAMED SALAMA HOSNY, démonstrateur au Département d'Entomologie de la Faculté d'Agriculture (Université Fouad I^{er}), présenté par Messieurs le Professeur Docteur HAMED SELEEM SOLIMAN Bey et le Docteur AHMED SALEM HASSAN ; Messieurs FLORIO SULLAM AND Co (produits chimiques et agricoles), présentés par Messieurs MOHAMED TEWFIK et A. ALFIERI ; Monsieur ABD EL-SALAM SHALABY, démonstrateur au Département d'Entomologie de la Faculté des Sciences (Université Farouk I^{er}), présenté par Messieurs MOHAMED TEWFIK et A. ALFIERI ; Monsieur ZAKI ALY CHARKAWI, de l'Inspectorat du Ministère de l'Agriculture à Assouan, présenté par Messieurs MOHAMED SOLIMAN EL-ZOHEIRY Bey et MAHMOUD HOUSNY ; Monsieur GAMAL IBRAHIM ISSA, démonstrateur en Entomologie à la Faculté d'Agriculture, Université Ibrahim Pacha El-Kébir, Chebin El-Kom, présenté par Messieurs ABDALLAH HABIB et A. ALFIERI ; THE NEAR EAST CHEMICAL AND FUMIGATION C^{e} (Amin Tewfik

Bey and C°), présnté par Messieurs MOHAMED TEWFIK et A. ALFIERI ; Monsieur le Capitaine D.B. BAKER, spécialiste en Hyménoptères aculéates, de Cheam (Angleterre), présenté par Messieurs le Professeur H.C. EFFLATOUN Bey et A. ALFIERI ; Monsieur ARMAND EUGÈNE LE GROS (arachnides, entomologie et écologie), présenté par Messieurs le Professeur H.C. EFFLATOUN Bey et A. ALFIERI ; et Monsieur MOHAMED KAMEL ABD EL-MEGUID TOLBA, conférencier en Entomologie, Faculté des Sciences, Université Ibrahim Pacha El-Kébir, Ghizeh (Orman), présenté par Messieurs le Docteur MAHMOUD HAFEZ et A. ALFIERI.

Echange de Publications :

Le Conseil approuve l'échange des publications de la Société contre celles : (1) du MUSEO CIVICO DI STORIA NATURALE DI VERONA, Italie ; (2) de l'ACADÉMIE POLONAISE DES SCIENCES ET DES LETTRES DE CRACOVIE, Pologne

Rapports Annuels :

Le Conseil approuve les Rapports du Secrétaire Général, du Trésorier et des Censeurs pour l'Assemblée Générale Ordinaire, dont la date est fixée au 8 Mars 1950.

Assemblée Générale Ordinaire du 8 Mars 1950

Présidence
de Monsieur le Professeur H. C. EFFLATOUN Bey, *Vice-Président.*

Rapport du Secrétaire Général (Exercice 1949) :

Messieurs,

Aux termes des Articles 24, 25 et 26 de nos Statuts, nous vous avons convoqués en Assemblée Générale Ordinaire pour vous présenter les Rapports du Secrétaire Général, du Trésorier et des Censeurs sur la situation morale, financière et comptable de la Société, pour donner au Conseil décharge de sa gestion, et pour procéder, par voie d'élections, au remplacement des Membres sortants du Conseil, et des deux Censeurs des comptes de l'Exercice en cours.

Messieurs,

Depuis notre dernière Assemblée, nous avons eu à déplorer la perte de quatre de nos Collègues : Professeur Filippo Silvestri (membre honoraire), A. Hustache (membre correspondant), Professeur Docteur A. Mochi et Docteur Mohamed Waly (membres titulaires). Nous vous prions d'observer une minute de silence en leur mémoire.

Messieurs,

En dépit de nos difficultés financières qui ne cessent d'accroître, notre contribution scientifique au service de la Nation a continué comme par le passé. Nous nous sommes appliqués à seconder les efforts des techniciens du Ministère de l'Agriculture, du corps enseignant et des étudiants des Facultés des Sciences et d'Agriculture des Universités Fouad Ier et Farouk Ier, ainsi que de toutes les personnes intéressées à l'entomologie systématique ou appliquée. Nous leur avons fourni tous les renseignements et références bibliographiques désirés, ainsi qu'un grand nombre de déterminations d'insectes de notre faune et de celle de l'Arabie.

Les visiteurs, parmi lesquels d'éminents collègues de l'Etranger, ont été très nombreux. Nos salles de lecture, nos laboratoires et notre Musée continuent à être aussi fréquentés que par le passé.

Le volume XXXIII de notre Bulletin, contenant plus de 500 pages abondamment illustrées, vous a été distribué récemment. Parmi les treize études originales qui y figurent, signalons la deuxième partie du travail de Monsieur E.P. Wiltshire "The Lepidoptera of the Kingdom of Egypt" qui termine une heureuse révision de nos Lépidoptères basée sur les données scientifiques les plus récentes.

Des conférences aussi nombreuses que variées ont été faites dans notre Siège, entre autres celles de Monsieur G.V.B. Herford, directeur du Laboratoire des Fléaux du Département des Recherches Scientifiques et Industrielles de Slough (Angleterre), sur le problème ardu de la préservation des céréales.

Nous avons adhéré au IIe Congrès International de Protection des Cultures qui s'est tenu à Londres du 20 au 29 Juillet.

Le Ministère de l'Agriculture nous a fait parvenir sa subvention annuelle de L.Eg. 1000.

Parmi les donations reçues figurent celles de la Société Royale d'Agriculture (L.Eg. 50), du Crédit Foncier Egyptien (L.Eg. 50), de la Banque Misr (L.Eg. 20), de l'Imperial Chemical Industries (L.Eg. 15), et de la Société Financière et Industrielle d'Egypte (L.Eg. 15). Nous présentons nos plus vifs remerciements et l'expression de notre profonde gratitude aux dirigeants de ces Institutions et les prions de bien vouloir continuer à nous témoigner leur bienveillant et constant appui.

Malgré les décès et quelques démissions, le nombre de nos membres de toutes catégories est en augmentation, soit 386 contre 375 en 1948.

17117 ouvrages et brochures, dûment enregistrés, figurent actuellement dans notre Bibliothèque, contre 16622 l'année précédente, en augmentation de 495 unités. Quatorze d'entre-eux représentent les dons reçus, quarante volumes (parmi lesquels le "Zoological Record", pars Insecta, volumes 70-84, 1933-1947) ont été acquis (L.Eg. 57.211), le restant provient de nos échanges avec 225 Institutions entomologiques ou scientifiques de tous pays.

La reliure de 89 volumes nous a coûté L.Eg. 31.150.

Votre Trésorier vous donnera lecture du Bilan des Comptes du quarante-deuxième Exercice social (qui se solde par un déficit de L.Eg. 291.026), dûment vérifié et approuvé par vos Censeurs, ainsi que des Prévisions Budgétaires pour l'Exercice 1950, dont l'excédent des dépenses sur les recettes sera de L.Eg. 434, qu'il faudra encore prélever sur la Réserve Générale.

Aux termes de l'Article 13 de nos Statuts, le Conseil est annuellement renouvelé par tiers. Les membres sortants cette année sont les suivants : Messieurs le Professeur H.C. Efflatoun Bey, le Professeur Docteur Kamel Mansour, le Docteur Saadallah Mohamed Madwar Bey, et A. Alfieri. Ils sont rééligibles.

Vos Censeurs, Messieurs E.A. Kaourk et Elhamy Greiss, sont également rééligibles.

En terminant, nous dédions respectueusement nos pensées à notre Auguste Souverain, Sa Majesté le Roi Farouk Ier, et Lui exprimons nos sentiments de profond dévouement et nos vœux les plus fervents.

Signé : A. ALFIERI.

Rapport du Trésorier :

Situation au 31 Décembre 1949

DÉPENSES	L.E.	MM.	RECETTES	L.E.	MM.
Loyer	1	005	Subvention Ministère Agriculture	997	995
Impôts et Assurances	55	611	Donations.............	150	000
Frais Généraux et Entretien...	254	371	Cotisations des Membres.... .	104	988
Personnel..................	1212	700	Droits d'Inscriptions..........	1	200
Publications	658	090	Intérêts de Banque	18	730
Bibliothèque................	88	361	Coupons Emprunt National....	583	520
			Vente Publications	16	279
			Encaissements divers..........	106	400
			Déficit prélevé sur la Réserve Générale........	291	026
	2270	138		2270	138

ACTIF	L.E.	MM.	PASSIF	L.E.	MM.
Immeuble Social	1	000	Réserve Générale	15228	303
Mobilier	1	000			
Bibliothèque	1	000			
Collections.	1	000			
Laboratoires	1	000			
Banque Nationale d'Egypte	2031	044			
Portefeuille Emprunt National..	13187	630			
Compagnie du Gaz............	4	629			
	15228	303		15228	303

Portefeuille Titres en dépôt à la Banque Nationale d'Egypte : 18000 L.Eg. Emprunt National 3 1/4 % (1963-1973).

Signé : R. WILKINSON.

Rapport des Censeurs :

En exécution du mandat que vous avez bien voulu nous confier, nous avons l'honneur de porter à votre connaissance que nous avons vérifié les Comptes de la Société Fouad Ier d'Entomologie pour l'année finissant le 31 Décembre 1949, avec les régistres et documents y relatifs.

Nous certifions que le Bilan reflète d'une façon exacte et sincère la situation de la Société telle qu'elle ressort des régistres et des explications qui nous ont été données.

Signé : E. A. KAOURK et ELHAMY GREISS.

Prévisions Budgétaires pour l'année 1950 :

RECETTES	L E.	MM.	DÉPENSES	L.E.	MM.
Subvention Ministère Agriculture .	1000	000	Loyer	1	000
Donations	150	000	Impôts	50	000
Cotisations des Membres	110	000	Assurances	27	000
Coupons Emprunt National	583	000	Frais Généraux	250	000
Intérêts de Banque	18	000	Entretien	30	000
Vente Publications	5	000	Personnel	1266	000
Prélèvement sur la Réserve Générale	434	000	Publications	550	000
			Bibliothèque	100	000
			Imprévus	26	000
	2300	000		2300	000

Signé : WILKINSON.

Décisions :

1) Le Procès-Verbal de l'Assemblée Générale Ordinaire du 23 Mars 1949 est lu et confirmé.

2) Les Rapports du Secrétaire Général, du Trésorier et des Censeurs pour l'Exercice 1949, ainsi que les Prévisions Budgétaires pour l'Exercice 1950, sont adoptés.

3) L'Assemblée donne décharge au Conseil de sa gestion pour l'Exercice 1949.

Elections :

Messieurs le Professeur H.C. EFFLATOUN Bey, A. ALFIERI et le Professeur Docteur KAMEL MANSOUR, membres du Conseil sortants, sont réélus. Monsieur ABD EL MEGID EL-MISTIKAWY est élu en remplacement de Monsieur le Docteur SAADALLAH MOHAMED MADWAR Bey. Leur mandat a une durée de trois ans.

Messieurs E. A. KAOURK et ELHAMY GREISS sont réélus Censeurs des Comptes de la Société pour l'Exercice 1950.

Félicitations et Remerciements :

Sur la proposition du Président, l'Assemblée Générale Ordinaire félicite les Membres du Conseil et les Censeurs élus ou réélus. Elle vote une motion de remerciements à l'adresse de Messieurs le Secrétaire Général, le Trésorier, les Membres du Conseil, les Censeurs, et de tous ceux qui, par leurs dons, leur collaboration et leur sympathie constante, ont aidé la Société à accomplir sa tâche au cours de l'Exercice 1949.

Réunion du Conseil du 29 Mars 1950

Présidence de Monsieur le Professeur H. C. EFFLATOUN Bey, *Vice-Président.*

Nécrologie :

Nous avons le vif regret d'annoncer le décès de Monsieur CHARLES ALLUAUD, Membre Honoraire de la Société depuis sa fondation.

Donation :

La Société a reçu L.Eg. 50 du CRÉDIT FONCIER EGYPTIEN.

Le Conseil remercie.

Don à la Bibliothèque :

Monsieur le Docteur MARCELLO LA GRECA, de Naples, a adressé onze separata de ses travaux sur les Orthoptères, publiés dans diverses revues italiennes durant les années 1941 à 1949.

Le Conseil remercie.

Abonnements et achats d'ouvrages pour la Bibliothèque :

Le Conseil décide l'abonnement aux périodiques ci-après : (1) PARASITOLOGY, et (2) THE ANNALS OF APPLIED BIOLOGY. D'autre part, il approuve l'achat de l'ouvrage « ZOOLOGY OF EGYPT » (1 volume, Anderson, Reptilia and Batracia, 1898; 1 volume, Anderson, Mammalia, 1902; 2 volumes, Boulenger, The Fishes of the Nile, 1907).

Nomination d'un Membre Honoraire :

Monsieur le Docteur V.D. WIGGLESWORTH, de Cambridge (Angleterre). est nommé Membre Honoraire de la Société.

Admission de Membres :

Monsieur le Docteur AMIN GAD, entomologiste à la Section d'Eradication des Insectes du Ministère de l'Hygiène Publique, proposé par Messieurs le Professeur H.C. EFFLATOUN Bey et le Docteur SAADALLAH MOHAMED MADWAR Bey, est admis à faire partie de la Société en qualité de membre titulaire.

Nomination d'un Membre du Conseil :

Monsieur EDGARD CHAKOUR, membre fondateur, devant s'absenter d'Egypte pour une longue période, adresse sa démission de Membre du Conseil.

Le Conseil regrette vivement de perdre ainsi la collaboration de cet estimé collègue et le remercie des précieux services qu'il a rendus à la Société pendant plus de quarante années.

D'autre part, conformément à l'article 13 des Statuts, le Conseil pourvoit au remplacement de Monsieur E. CHAKOUR en nommant Monsieur le Docteur SAADALLAH MOHAMED MADWAR Bey Membre du Conseil, pour la durée du mandat de celui qu'il remplace.

Nomination d'un Membre Correspondant :

Monsieur EDGARD CHAKOUR est nommé Membre Correspondant de la Société.

Bureau du Conseil pour l'Exercice 1950 :

Sont réélus : Vice-Présidents, Messieurs le Professeur H.C. EFFLATOUN Bey et MOHAMED SOLIMAN EL ZOHEIRY Bey ; Secrétaire Général, Monsieur A. ALFIERI ; Trésorier, Monsieur RICHARD WILKINSON.

Comité Scientifique :

Sont réélus : Messieurs le Professeur H.C. EFFLATOUN Bey, MOHAMED SOLIMAN EL ZOHEIRY Bey, le Professeur Docteur HAMED SELEEM SOLIMAN Bey, le Professeur Docteur KAMEL MANSOUR, le Professeur Docteur H. PRIESNER; le Docteur SAADALLAH MOHAMED MADWAR Bey, le Docteur MAHMOUD HAFEZ, et A. ALFIERI.

Commémoration du Quatorzième Anniversaire de la mort du Roi Fouad I^er^ (28 Avril 1950)

Le Conseil de la Société a été présent, à la Mosquée Rifaï, à l'occasion de la Commémoration du Quatorzième Anniversaire de la mort du Très-regretté Roi Fouad I^{er}. Il a déposé une couronne dans le mausolée royal, et, à l'issu de la cérémonie, s'est inscrit sur les régistres du Palais d'Abdine.

Anniversaire de l'Avènement au Trône de Sa Majesté le Roi Farouk Ier (6 Mai 1950)

A l'occasion de l'Avènement au Trône de Sa Majesté le Roi FAROUK Ier, le Conseil d'Administration et les Membres de la Société ont adressé une dépêche à Son Excellence le Grand Chambellan, le priant de transmettre à l'Auguste Souverain leurs félicitations et leurs vœux les plus sincères.

Séance Publique du 10 Mai 1950

Présidence de Monsieur le Professeur H.C. EFFLATOUN Bey, *Vice-Président.*

Communications :

Monsieur JACQUES DE BEAUMONT : Résultats de l'Expédition de l'Armstrong College à l'Oasis de Siwa (Désert Libyque), 1935, sous la Direction du Professeur J. Omer-Cooper : Specidae (Hymenoptera).

Monsieur MAURICE PIC : Deux nouveaux Coléoptères d'Egypte et Nubie.

Professeur Docteur H. PRIESNER : Contributions towards a knowledge of the Thysanoptera of Egypt, XV.

Professeur Docteur H. PRIESNER : Studies on the genus *Scolothrips* [Thysanoptera].

Professeur Docteur H. PRIESNER : Further studies in *Haplothrips* and allied genera [Thysanoptera].

Monsieur WALTER SOYKA : New and known Alaptids and Mymarids from Egypt [Hymenoptera-Chalcidoidea].

Monsieur A.S. TALHOUK : A list of insects observed on economically important plants and plant products in Lebanon.

Monsieur EDWARD WAGNER : Neue Hemiptera-Heteroptera aus Nordafrika.

Monsieur D.E. KIMMINS : Results of the Armstrong College Expedition to Siwa Oasis (Libyan Desert), 1935, under the Leadership of Prof. J. Omer-Cooper : Odonata and Neuroptera.

Monsieur le Docteur A.I. HASSAN : The Theraphosidae in Egypt, with a description of *Chaetopelma shabati* spec. nov. [Araneae].

Monsieur le Docteur ABD EL-AZIZ EL-SAYED GHABN : Field Tests on a number of old and new insecticides against *Thrips tabaci* Lind. (Thysanoptera) attacking Cotton seedlings and Onion in Egypt.

Monsieur SALEH KAMEL EL-SAWAF : Life-history of the Greater Waxmoth (*Galleria melonella* L.) in Egypt, with special reference to the Morphology of the mature larva.

Monsieur MOHAMED HUSSEIN : A comparison of wet and dry bran baits.

Monsieur le Docteur A.A.G. HASSAN : The classification and evolution of the spiracular system in insects.

Réunion du Conseil du 31 Mai 1950

Présidence de Monsieur le Professeur H.C. Efflatoun Bey,
Vice-Président.

Don à la Bibliothèque :

La Société a reçu de Monsieur le Docteur Roepke (de Hollande) 3 tirés à part de ses travaux publiés durant les années 1948-1949, et de Monsieur le Professeur J. Omer-Cooper (de Grahamston, Afrique du Sud) 14 separata relatifs à l'entomologie et dont 5 d'entre-eux contiennent des travaux émanant du donateur.

Le Conseil remercie.

Achat pour la Bibliothèque :

Le Conseil décide l'acquisition de l'ouvrage « Nomenclator Zoologicus » (4 volumes 1758-1935, et 1 volume 1935-1945).

Nomination de Membres Honoraires :

Sont nommés Membres Honoraires de la Société : Messieurs L. Berland, Lucien Chopard, le Docteur W.J. Hall, le Professeur René Jeannel, Sir Guy Marshall, le Professeur Docteur J.W. Munro, le Docteur S.A. Neave, R.E. Snodgrass, le Docteur V.D. Wigglesworth, et le Docteur C.B. Williams.

Nomination de Membres Correspondants :

Sont nommés Membres Correspondants de la Société : Messieurs A. Balachowsky, Ch. Boursin, W.E. China, le Docteur O.W. Richards, E. Séguy, le Docteur W.H. Thorpe, et P. Vayssière.

Admission d'un Membre :

Sur la proposition de Messieurs Abd El-Megid El-Mistikawy et A. Alfieri, Monsieur Ahmed Moustafa, de l'Imperial Chemical Industries (branche du Caire), est admis à faire partie de la Société en qualité de membre titulaire.

Réunion du Comité Scientifique du 31 Mai 1950

Présidence de Monsieur le Professeur H.C. Efflatoun Bey,
Vice-Président

Le Comité Scientifique approuve l'impression dans le Bulletin de la Société, volume XXXIV, pour l'année 1950, des communications qui ont été lues à la Séance Publique du 10 Mai 1950.

Réunion du Conseil du 25 Octobre 1950

Présidence de Monsieur le Professeur H.C. EFFLATOUN Bey,
Vice-Président.

Distinctions honorifiques :

Nous avons le plaisir de faire savoir que nos collègues Messieurs le Docteur KAMEL MANSOUR et le Docteur MOHAMED TAHER EL-SAYED ont été respectivement nommés Doyen et Professeur d'Entomologie à la Faculté des Sciences de l'Université Ibrahim Pacha El-Kébir.

D'autre part, Messieurs le Professeur H.C. EFFLATOUN Bey, le Docteur MAHMOUD HAFEZ et A. ALFIERI ont été nommés membres de l'Institut Fouad Ier du Désert.

Le Conseil leur adresse ses plus vives félicitations.

Dons à l'Institut Fouad Ier du Désert :

Heureux de contribuer à la création du Musée d'Histoire Naturelle de l'Institut Fouad Ier du Désert, le Conseil de la Société approuve un don de spécimens zoologiques (faune désertique) et botaniques. D'autre part Monsieur A. ALFIERI, conservateur de la Société, a bien voulu se charger de l'organisation de l'exposition entomologique de cet Institut.

Dons à la Bibliothèque :

La Société a reçu de Monsieur le Docteur ROBERTO LEVI CASTILLO, de Guayaquil, huit tirés à part de ses travaux sur les moustiques de la République de l'Equateur, publiés durant les années 1947-1949 ; de Monsieur le Docteur O.W. RICHARDS, de Londres, vingt-neuf séparata de ses travaux entomologiques publiés dans diverses revues de 1927 à ce jour ; de Monsieur le Docteur A. KHALIFA, de la Faculté d'Agriculture de l'Université Ibrahim Pacha El-Kébir de Chebin El-Kom, trois séparata de ses travaux publiés durant les années 1949 et 1950.

Le Conseil remercie.

Echange de Publications :

Le Conseil approuve l'échange des publications avec les Institutions ci-après : (a) Vysoka Skola Zemedelska v Brné, Usavt Ponzité Entomologie, Brno, Czécoslovaquie (FOLIA ENTOMOLOGICA) ; (b) DUSENIA, Publicatio Periodica de Scientia Naturali, Parana, Brésil ; (c) Facultad de Ciencias Naturales y Museo de la Plata, République Argentine (REVISTA Y NOTAS, Zoologia).

Nomination de Membres :

Sont admis à faire partie de la Société : Monsieur GEORG FREY, de Munich (Allemagne), présenté par Messieurs le Professeur Docteur H.

PRIESNER et A. ALFIERI ; Monsieur MOUSTAPHA SAMHANE, de la Section d'Entomologie du Ministère de l'Agriculture, présenté par Messieurs MOHAMED SOLIMAN EL-ZOHEIRY Bey et ANTOINE CASSAB.

Réunion du Conseil du 20 Décembre 1950

Présidence de Monsieur MOHAMED SOLIMAN EL-ZOHEIRY Bey, *Vice-Président*

Donations :

La Société a reçu : L.Eg. 20 de la BANQUE MISR, L.Eg. 50 de la SOCIÉTÉ ROYALE D'AGRICULTURE, et L.Eg. 15 de la SOCIÉTÉ FINANCIÈRE ET INDUSTRIELLE D'EGYPTE.

Le Conseil remercie.

Dons à la Bibliothèque :

Monsieur EDGARD CHAKOUR fait don du « Dictionnaire d'Histoire Naturelle », édité par Charles d'Orbigny en 1867-1869 (17 volumes) ; la SOCIÉTÉ ENTOMOLOGIQUE DE BELGIQUE offre ses « Mémoires », volumes I-XXII (1892-1914).

Le Conseil remercie ces généreux donateurs.

Echange de Publications :

Le Conseil approuve l'échange avec le WAITE AGRICULTURAL INSTITUTE d'Adelaide, Australie.

Festival of Britain :

La Société Royale Entomologique de Londres nous a très aimablement fait savoir qu'elle serait heureuse de se mettre à la disposition, dans la mesure du possible, des entomologistes d'Egypte qui participeraient au IX^e Congrès International d'Entomologie (Amsterdam, été 1951) et qui désireraient visiter l'Angleterre à l'occasion du « Festival of Britain » durant la période précédant le Congrès, et ce en vue de leur faciliter le séjour en Grande-Bretagne.

La Société Fouad I^{er} d'Entomologie remercie la Société Royale Entomologique de Londres de sa délicate initiative, et prie les membres de la Société Fouad I^{er} d'Entomologie, qui désireraient s'assurer un logement durant leur séjour en Angleterre, de vouloir bien, à cet effet, prendre contact avec le Secrétariat honoraire de la Société Royale Entomologique de Londres (41, Queen's Gate, South Kensington, S.W. 7).

RÉSULTATS DE L'EXPÉDITION DE L'ARMSTRONG COLLÈGE A L'OASIS DE SIWA (DÉSERT LIBYQUE), 1935, SOUS LA DIRECTION DU PROFESSEUR J. OMER-COOPER

Sphecidæ

[Hymenoptera]

par JACQUES DE BEAUMONT,
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INTRODUCTION

Composition générale de la faune

La collection de Sphecidae récoltés par l'expédition à l'oasis de Siwa, du 14 avril au 11 septembre 1935, comprend 428 exemplaires, qui se répartissent en 43 espèces. D'après M. Omer-Cooper, il est probable que les espèces d'insectes capturées par lui-même et ses collaborateurs représentent nettement plus du 60 % de celles qui habitent la région ; vers la fin du séjour, il fut rarement capturé une espèce, même de très petit Hyménoptère, qui n'ait pas été rencontrée auparavant.

Si ces constatations sont exactes, ce dont je ne doute pas, il en résulte que la faune des Sphecidae de Siwa est très pauvre. On peut être frappé par exemple de l'absence totale de certains genres, souvent bien représentés dans la région saharienne, tels que *Philanthus*, *Palarus*, *Prosopigastra*, *Oxybelus*. Deux espèces d'*Ammophila*, deux de *Sphex* et quatre de *Cerceris* ont seulement été récoltées, alors que la faune saharienne comprend au moins 25 espèces pour le premier genre, 10 pour le deuxième et une trentaine pour le troisième. A titre de comparaison, on peut indiquer que 160 espèces environ ont été signalées de Biskra, autre oasis saharienne et que la faune de la Basse Egypte comprend au moins 250 Sphécides.

A quoi tient cette pauvreté ? Il est possible, comme le suppose M. Omer-Cooper, qu'elle soit dûe à la salinité du sol ; tous les Sphécides récoltés nidifient effectivement dans le sol. Si la faune est généralement très

pauvre, il est possible aussi que manquent les proies appropriées à certaines espèces. N'oublions pas non plus que l'abondance des diverses espèces varie beaucoup d'une année à l'autre et que certaines d'entre elles, très printanières, avaient peut-être déjà disparu à l'arrivée de l'expédition.

Endémismes et races locales

Aucune des espèces récoltées n'est endémique à Siwa ; je fais cependant une légère restriction pour les espèces de *Stizus* que je n'ai pu déterminer avec certitude. Par contre, il est fort possible que certaines espèces soient représentées par des sous-espèces plus ou moins nettement différenciées ; mes connaissances encore incomplètes des régions avoisinantes ne me permettent pas d'affirmer que ces formes soient propres à Siwa, et je ne les nommerai pas pour le moment. Dans plusieurs cas (*Bembex, Stizus, Sphecius*) les individus de Siwa présentent un mélanisme ou un rufinisme plus ou moins net par rapport aux représentants de la même espèce habitant les zones sahariennes plus occidentales ou la Basse Egypte.

Zoogéographie

On peut distinguer en Afrique du nord, et sans préjuger de leur origine, deux faunes assez nettement distinctes, appartenant toutes deux au règne paléarctique : la faune méditerranéenne et la faune saharienne. En ce qui concerne les Sphecidae, un nombre relativement restreint de genres est caractéristique de l'une ou de l'autre de ces faunes. Par contre, dans certains genres, il existe des groupes d'espèces plus typiquement sahariens, d'autres plus proprement méditerranéens ; souvent même, ce sont des espèces très voisines, ou même des sous-espèces, dont l'une est méditerranéenne, l'autre saharienne.

La limite entre les deux régions peut être tracée, dans l'Afrique du Nord-Ouest, en consultant les cartes phytogéographiques ; elle correspond plus ou moins exactement avec le pied sud de l'Atlas. Pour l'Afrique du Nord-Est, je suis moins bien renseigné, mais l'oasis de Siwa est sans doute comprise dans la zone saharienne. L'on est surtout très peu au clair sur la limite méridionale de la faune saharienne et sur ses rapports avec la faune éthiopienne. Quoi qu'il en soit, beaucoup d'espèces sahariennes ont une vaste aire de répartition, allant de l'Egypte au Rio de Oro.

Si, du point de vue botanique, il est souvent aisé de tracer une limite assez nette entre les régions saharienne et méditerranéenne, il n'en est pas de même en ce qui concerne la faune. Certes, l'on trouve un assez grand nombre d'espèces qui se conforment à la ligne de démarcation indiquée par les phytogéographes, les unes étant strictement sahariennes, d'autres strictement méditerranéennes. Mais plusieurs faits viennent troubler cette ordonnance simple. C'est ainsi que bien des espèces ont une valence écologique

suffisamment grande pour qu'elles puissent franchir la limite ; les unes, par exemple, seront plutôt sahariennes, mais pourront pénétrer plus ou moins loin dans la région méditerranéenne. D'autre part, il existe, dans la zone saharienne, de véritables enclaves méditerranéennes, naturelles ou, comme les oasis cultivées, plus ou moins artificielles. Dans la zone cultivée des oasis peuvent vivre des espèces méditerranéennes qui manquent déjà totalement dans les environs immédiats. Il est enfin un dernier facteur qu'il ne faut pas perdre de vue, c'est l'influence des saisons. Il est certain qu'au printemps l'on trouve un plus grand nombre d'espèces méditerranéennes dans la région saharienne, tandis que les chaleurs de l'été permettent le développement, dans certaines zones méditerranéennes, d'espèces sahariennes.

On comprendra facilement que les divers facteurs qui viennent d'être signalés rendent difficile toute étude zoogéographique dans l'Afrique du nord, et qu'il faut être prudent en établissant le spectre faunistique d'une localité. Je me contenterai donc de donner ici les types de répartition générale des espèces trouvées à Siwa.

(1) Espèces répandues sur une grande partie du continent africain, et, en particulier, dans tout le nord de l'Afrique. Plusieurs d'entre elles ont une répartition plus vaste encore. *Ammophila tydei* Le Guillou et *Sceliphron spirifex* L. se rencontrent dans toute la région méditerranéenne et dans toute l'Afrique ; *Liris haemorrhoidalis* F. et *nigricans* Walk. dans la région méditerranéenne orientale, tout le continent africain et, en Asie, jusqu'aux Indes ; *Sphex viduatus* Chr. a une répartition analogue, mais va jusqu'en Chine. Ces diverses espèces, dans l'Afrique du nord, habitent aussi bien la région méditerranéenne que la région saharienne. Quant à *Liris memnonia* Sm., qui a été trouvée dans l'Afrique tropicale, elle semble, en Afrique du nord, se trouver surtout dans la région saharienne.

Le nombre des espèces communes à l'Afrique paléarctique et à l'Afrique éthiopienne (pouvant être représentées dans ces deux régions par des sous-espèces distinctes) devra probablement être augmenté lorsque les études comparées des deux faunes auront été plus poussées. Il restera encore à rechercher quelle est l'origine (paléarctique ou éthiopienne) de ces formes.

(2) Espèces qui n'ont pas été signalées de la région éthiopienne, mais qui habitent toute l'Afrique du nord et une grande partie de la région méditerranéenne. La plupart d'entre elles sont connues de presque tout le pourtour de la Méditerranée : *Cerceris bupresticida* Duf., *Bembex oculata* Latr., *Stizus pubescens* Kl., *Larra anathema* Rossi, *Liris nigrita* Lep., *Tachysphex pygidialis* Kohl, *mantivorus* Beaum., *schmiedeknechti* Kohl, *nitidior* Beaum., *cabrerai* Mercet. En Afrique du nord, ces espèces se rencontrent dans la zone méditerranéenne, mais peuvent pénétrer plus ou moins loin dans la région saharienne.

(3) Espèces répandues dans une grande partie de l'Afrique du nord, mais qui n'ont pas été signalées ailleurs, sinon, pour certaines d'entre elles, dans l'Asie occidentale. La plupart sont assez strictement sahariennes : *Bembex dahlbomi* Handl., *Stizus vespoïdes* Walk., *succineus* Kl., *fuliginosus* Kl., *Liris cooperi* n.sp., *Tachysphex grandissimus* Gussak., *vestitus* Kohl., *Miscophus manzonii* Grib. D'autres sont sahariennes aussi, mais pénètrent plus ou moins dans la région méditerranéenne : *Ammophila haimatosoma* Kohl, *Cerceris solitaria* Dahlb., *fischeri* Spin., *Gastrosericus waltlii* Spin.

(4) Espèces ayant, en Afrique du nord, une répartition restreinte. La plupart sont plus ou moins strictement sahariennes. Certaines ont été trouvées aussi bien en Basse Egypte que plus ou moins loin à l'ouest de Siwa : *Stizus hyalipennis* Handl., *saharae* Roth, *cheops* Morice, *rapax* Handl., *Gorytes mesostenus* Handl., *Liris opalipennis* Kohl, *Tachytes melanopygus* Costa, *Tachysphex cheops* Beaum., *osiris* Beaum. Deux espèces, connues de Basse Egypte, n'ont pas été signalées jusqu'à présent à l'ouest de Siwa : *Sphex crudelis* Sm., répandu jusqu'en Abyssinie et aux Indes et *Tachytes niloticus* Turn., cité de Basse Egypte seulement. Enfin, 4 espèces trouvées à Siwa ne sont pas connue de Basse Egypte : *Cerceris palmetorum* n. sp. et *Sphecius claripennis* Morice, répandus jusque dans le Sud Algérien, *Tachytes maculicornis* Saund. et *Tachysphex nubilipennis* n. sp., que l'on a rencontrés jusqu'au Maroc saharien.

Il est naturellement très possible qu'une documentation plus complète vienne, par la suite modifier quelque peu les données que je viens d'établir. Celles-ci, d'ailleurs, ne me permettent pas d'émettre d'hypothèse particulière sur le peuplement de Siwa, problème qui se confond avec celui, beaucoup plus vaste, du peuplement de toute la région saharienne. Ce que l'on peut affirmer, par contre, c'est que les insectes récoltés de façon si complète par l'expédition de l'Armstrong College formeront un matériel des plus précieux lorsqu'il s'agira de traiter les problèmes de la zoogéographie nord-africaine.

Coloration des Sphecidae sahariens

M. Omer-Cooper a insisté sur l'intérêt que présente l'étude de la coloration des animaux du désert. Parmi les Sphecidae, on peut distinguer, à ce point de vue, divers types.

(1) Espèces à pilosité argentée abondante. Comparées à des espèces voisines habitant d'autres régions, celles qui se trouvent dans le désert sont souvent caractérisées par une pilosité argentée plus ou moins abondante recouvrant le corps. Ce phénomène peut se remarquer aussi chez une même espèce, lorsque son aire de répartition la fait habiter aussi bien la région saharienne que la région méditerranéenne. Cette pilosité argentée est souvent accompagnée d'une extension plus grande de la couleur rouge chez les formes

noires et rouges et, fréquemment aussi, ces insectes ont des ailes entièrement hyalines ou marquées d'une tache foncée à l'extrémité. Parmi les espèces récoltées à Siwa, ce type se rencontre, très accusé, chez *Tachysphex osiris* Beaum., *vestitus* Kohl, *nubilipennis* n. sp. ♀ ; on le remarque aussi, à un moindre degré, chez *Sphex viduatus* Chr., *Tachysphex cheops* Beaum., *grandissimus* Gussak., *Gastrosericus waltlii* Spin., *Miscophus manzonii* Grib. Chez plusieurs espèces, à corps noir, la pilosité argentée est aussi un peu plus développée que chez les formes habitant les régions non désertiques ; c'est ce que l'on voit par exemple chez *Liris memnonia* Sm., *cooperi* n. sp., *opalipennis* Kohl, *Tachysphex maculicornis* Saund. et *niloticus* Turn.

(2) Espèces à coloration jaune étendue. Chez les genres dont les espèces sont généralement colorées en jaune et noir, on observe souvent que les formes désertiques présentent une grande extension de la coloration claire. Ce type est bien évident chez *Cerceris palmetorum* n. sp. et *Bembex dahlbomi* Handl., moins accusé chez *Stizus vespoïdes* Walk. et *hyalipennis* Handl.

(3) Espèces de coloration noire. A côté des formes claires signalées ci-dessus, la faune du Sahara comprend également des insectes de coloration très foncée. Chez les Sphecidae, il existe dans toutes les régions des espèces à corps noir, mais, dans les régions désertiques, cette coloration peut s'accompagner d'un fort obscurcissement des ailes. Parmi les espèces de Siwa, on remarque cette coloration particulière chez *Cerceris solitaria* Dahlb., *Stizus saharae* Roth, *fuliginosus* Kl., *Liris nigrita* Lep., *Tachysphex nubilipennis* n. sp. ♂.

(4) Espèces ne présentant pas de coloration particulière. Il existe, dans la région saharienne, une série d'espèces qui ne présentent pas, par rapport à celles d'autres régions, de coloration particulière. Il est intéressant de noter que ce sont surtout celles dont l'aire de répartition est grande et qui habitent aussi, par exemple, la région méditerranéenne.

Tels sont les faits que l'on peut constater chez les Sphecidae. La discussion de leur interprétation nous mènerait bien loin et je la laisse de côté pour l'instant.

Le problème de l'estivation

Le programme de l'expédition prévoyait entre autres l'étude de l'estivation : la faune désertique s'appauvrit-elle durant les mois les plus chauds, de juin à août ? De façon générale, M. Omer-Cooper a l'impression que ce n'est pas le cas et l'étude des Sphecidae vient confirmer ce point de vue. Chez la plupart des espèces où un nombre assez grand d'exemplaires ont été récoltés, la période d'activité semble ininterrompue, de mai ou de juin jusqu'à la fin d'août ou au début de septembre, sans que l'on puisse d'ailleurs préciser s'il s'agit d'une ou de plusieurs générations. Un certain nombre

d'espèces n'ont été trouvées qu'en mai-juin, mais en un très petit nombre de spécimens, ce qui ne permet pas d'affirmer que leur période d'activité ne s'étendit pas aussi aux mois d'été.

Il est évident que, comme dans n'importe quelle autre région, les diverses espèces de la faune désertique ont chacune leur période de vol. Un petit nombre d'entre elles apparaissent en hiver ou au premier printemps ; d'autres ont leur maximum en mai ou juin ; mais il semble bien que le plus grand nombre d'espèces se rencontrent en été.

On peut donc dire que l'estivation existe pour certaines espèces, mais que ce phénomène n'existe pas si l'on considère la faune dans son ensemble.

LISTE DES ESPECES

Genre Ammophila Kirby

1. Ammophila (Podalonia) tydei Le Guillou

Localités : Siwa, 24.iv, 1 ♂, 1 ♀ ; 1.v, 1 ♀ ; 7.v, 1 ♂, 1 ♀ ; 9.v, 1 ♀ ; 20.v, 2 ♂♂ ; 24.v, 1 ♂ ; 25.v, 1 ♀ ; 28.v, 1 ♂, 2 ♀♀ ; 4.vi, 1 ♀ ; 29.vi, 2 ♀♀ ; 12.vii, 2 ♂♂ ; 15.vii, 1 ♂, 1 ♀ ; 24.vii, 1 ♀ ; 25.vii, 1 ♂ ; 27.vii, 2 ♀♀ ; 31. vii, 1 ♂ ; 6.viii, 2 ♀♀ ; 9.viii, 1 ♂ ; 19.viii, 1 ♂ ; 20.viii, 1 ♂ ; 21.viii, 2 ♀♀ ; 22.viii, 1 ♂, 1 ♀ ; 21-22.viii, 3 ♂♂, 2 ♀♀ ; 29.viii, 1 ♀. Siwa, Zegawa, 8.v, 1 ♀. Zeitoun, 17.v, 1 ♀.

Distribution : Pourtour de la Méditerranée ; toute l'Afrique.

Remarques : Plusieurs de ces individus sont de faible taille ; les plus petits ♂♂ mesurent 11-12 mm., les plus petites ♀♀ 12-13 mm. ; d'autres spécimens sont de taille normale, reliés d'ailleurs aux précédents par tous les intermédiaires. La sculpture du propodéum est proportionnellement plus forte, avec une tendance à la striation transversale, chez les exemplaires de petite taille. L'armature génitale des ♂♂ reste toujours caractéristique, en particulier par les forts crochets de la face inférieure du pénis.

2. Ammophila (Ammophila) haimatosoma Kohl

Localités : Siwa, 13.vii, 1 ♂ ; 14.vii, 3 ♂♂ ; 15.vii, 2 ♂♂, 1 ♀ ; 19.vii, 1 ♀ ; 21.vii, 1 ♂ ; 21-22.vii, 3 ♂♂ ; 24.vii, 1 ♂, 2 ♀♀ ; 19.viii, 1 ♀ ; 22.viii, 1 ♂, 1 ♀. Khamissa, 22.vi, 1 ♂. Zeitoun, 17.v, 2 ♀♀ ; 29.viii, 1 ♂. Lake Shiata, 2.viii, 1 ♂.

Distribution : Afrique du nord, régions méditerranéenne et saharienne. ? Chypre.

Remarques : Comme c'est généralement le cas chez les individus de la Basse Egypte et du Sud Algérien (Biskra), la coloration rouge est peu développée sur le thorax ; chez les ♀♀, il n'y a que deux petites taches rouges sur les côtés du pronotum et du mésonotum ; ces taches sont encore plus réduites chez les ♂♂.

Genre Sphex Linné

3. Sphex (Prionyx) viduatus Christ

Localités : Siwa, 24.v, 1 ♀ ; 16.vii, 1 ♂ ; 29.vii, 1 ♂ ; 9.viii, 1 ♀ ; 13.viii, 1 ♀ ; 19.viii, 2 ♀♀ ; 22.viii, 1 ♀ ; 29.viii, 1 ♀ ; 2.ix, 1 ♂. Maragi, 14.viii, 1 ♂. Koreishid, 30.vi, 1 ♂. Gara, 4.vii, 1 ♂.

Distribution : Méditerranée orientale. Toute l'Afrique. Asie jusqu'aux Indes et en Chine.

Remarques : Roth (1925) a insisté sur la variabilité de cette espèce. Comparés à des exemplaires du Maroc et de Biskra, ceux de Siwa se distinguent par la réduction de la couleur noire sur les derniers tergites (parmi les ♀♀, seule celle du 25.v montre les taches noires sur les tergites 4 et 5), par la ponctuation du thorax plus espacée et, chez les ♀♀ surtout, par les côtés du propodéum, qui sont glabres et brillants, quoique striés. Ces spécimens sont donc semblables à ceux de la vallée du Nil, tels que les décrit Honoré (1944), semblables aussi aux grands spécimens signalés d'Algérie par Roth.

4. Sphex (Priononyx) crudelis Smith

(= *aegyptius* Lepeletier)

Localités: Siwa, 24.v, 1 ♂ ; 4.vi, 1 ♂ ; 30.vi, 2 ♂♂, 1 ♀ ; 13.vii, 1 ♂, 1 ♀ ; 16.vii, 2 ♂♂ ; 23.vii, 1 ♀ ; 24.vii, 1 ♀ ; 29.vii, 1 ♀ ; 31.vii, 1 ♂ ; 22.viii, 1 ♂.

Distribution : Vallée du Nil. Abyssinie. Syrie. Arabie. Inde nord.

Remarques : Pour la synonymie de cette espèce, voir : de Beaumont 1949.

Genre Sceliphron Klug

5. Sceliphron spirifex Linné

Localités : Siwa, 25.v, 4 ♀♀ ; 4.vi, 1 ♀ ; 25.vii, 1 ♀ ; 7.viii, 1 ♀ 9.viii, 1 ♀. Maragi, 14.viii, 1 ♂. Koreishid, 30.vi, 2 ♂♂ ; 22.viii, 1 ♀. Khamissa, 22.vi, 6 ♀♀. Zeitoun, 17.v, 1 ♀

Distribution : Région méditerranéenne. Toute l'Afrique. Asie occidentale.

Genre Cerceris Latreille

6. Cerceris fischeri Spinola

Localités : Siwa, 7.v, 1 ♂ ; 28.v, 1 ♂ ; 24-28.vi, 1♂, 13.vii, 2♂♂ ; 15.vii, 7 ♂♂ ; 31.vii, 1 ♀ ; 9.viii, 1 ♂ ; 19.viii, 1 ♂, 4 ♀♀ ; 20.viii, 1 ♂ ; 21.viii, 1 ♂ ; 25.viii, 2 ♂♂ ; 31.viii, 1 ♂ ; 6.ix, 1 ♂. Maragi, 14.viii, 4 ♂♂, 1 ♀.

Distribution : Afrique du nord, surtout dans la région saharienne. Palestine.

7. Cerceris bupresticida Dufour

Localité : Siwa, 12.viii, 1 ♀.

Distribution : Pourtour de la Méditerranée ; n'a pas été signalé d'Egypte.

Remarques : Ce spécimen est morphologiquement semblable à ceux de l'Afrique du nord-ouest que j'ai examinés ; il s'en distingue par la coloration de l'abdomen, qui semble cependant en partie modifiée post mortem. Les tergites 1-5 sont d'un jaune assez ferrugineux, avec une bande plus franchement ferrugineuse à l'extrémité du 2e et une tache de même couleur à la base du 3e et du 4e.

8. Cerceris palmetorum n. sp.

Localités : El Arig, 8.vi, 1 ♀ ; 18.vi, 1 ♂. Bahareiu, 11.vi, 3 ♂♂. Sitra, 15.vi, 1 ♂.

Distribution : Je connais cette espèce de Biskra et de Cyrénaïque.

Remarques : Cette espèce, du groupe de *bupresticida*, à corps presque entièrement jaune, sera décrite dans un autre travail.

9. Cerceris solitaria Dahlbom

(= *erythrocephala* Dahlbom)

Localités : Siwa, 23.v, 1 ♀ ; 24.v, 5 ♂♂, 1 ♀ ; 31.v-1.vi, 1 ♂ ; 22.viii, 1 ♂.

Distribution : Afrique du nord, surtout dans la région saharienne.

Remarques : J'ai examiné (Muséum de Stockholm), les types de *solitaria* et d'*erythrocephala*. Le premier est sans doute le ♂, le deuxième la ♀ de la même espèce, généralement connue sous le nom d'*erythrocephala ;* le nom de *solitaria*, imprimé quelques lignes plus haut, à la priorité.

Comme l'a fait remarquer Mochi (1938), la coloration est très variable, surtout chez les ♂♂. Les ♀♀ de Siwa sont colorées comme celle que figure Mochi, mais avec le pétiole en partie ferrugineux. Aucun des ♂♂ ne présente de taches jaunes au thorax ou à l'abdomen ; chez 6 exemplaires, ces parties sont colorées comme chez les ♀♀, mais avec le pétiole entièrement ferrugineux et parfois des taches de cette couleur au propodéum ; chez le 7e, le thorax et l'abdomen sont entièrement noirs. Ces ♂♂ correspondent donc à la forme que Mochi nomme *gynochroma*.

Genre Bembix Fabricius

10. Bembix dahlbomi Handlirsch

Localités : Siwa, 23.v, 1 ♂ ; 1.vi, 1 ♀ ; 4.vi, 2 ♀♀ ; 15.vii, 1 ♂,

1 ♀ ; 27.vii, 1 ♂ ; 14.viii, 1 ♀ ; 19.viii, 1 ♀ ; 22.viii, 2 ♀♀. Maragi, 14.viii, 1 ♀. Khamissa, 22.vi, 1 ♀. El Arig, 7-8.vi, 1 ♂, 8 ♀♀ ; 18.vi, 1 ♀. Baharein, 9-13.vi, 1 ♂, 2 ♀♀. Sitra, 14-15.vi, 2 ♂♂. Lake Shiata, 2.viii, 5 ♀♀.

Distribution : Afrique du nord, dans la région saharienne.

Remarques : Ces exemplaires sont un peu plus foncés que ceux de Biskra. Les taches discales claires du mésonotum sont souvent étroites et interrompues chez les ♂♂. Chez les ♀♀, les deux taches dorsales noires du premier tergite sont parfois réunies ; celles du 3e tergite touchent souvent la bande basale et il peut en être de même sur le 2e tergite ; le mésosternum montre généralement deux grandes taches noires et le 2e sternite est souvent orné d'une grande tache noire médiane.

11. Bembix oculata Latreille

Localités : Siwa, 13.vii, 1 ♂ ; 16.vii, 1 ♂ ; 21-22.vii, 1 ♂ ; 27.vii, 2 ♂♂ ; 31.vii, 1♂ ; 19.viii, 1 ♂, 3 ♀♀ ; 25.viii, 1 ♂ ; 29.viii, 1 ♂, 6 ♀♀ ; 8.ix, 1 ♂. Maragi, 14.viii, 1 ♂. Koreishid, 30.vi, 3 ♂♂, 1 ♀.

Distribution : Tout le pourtour de la Méditerranée ; en Afrique du nord, plutôt dans la région méditerranéenne.

Remarques : Cette espèce présente, dans ses caractères chromatiques, une variation géographique étendue. Les individus de Siwa appartiennent à une race d'assez grande taille (14-18 mm.), très foncée. Le 2e tergite ne porte jamais de taches noires libres ; les bandes jaunes sont étroites ; celle du premier tergite est interrompue chez la moitié des ♂♂, tandis que chez les ♀♀, elle est réduite à de petites taches latérales ; chez la plupart des ♀♀ les bandes des tergites 2-4 sont interrompues au milieu et le 5e tergite est généralement noir, parfois avec de petites taches latérales jaunes. Thorax et propodéum très peu tachés, ce dernier souvent noir chez la ♀. Chez la ♀, le clypéus est entièrement noir, le labre noirâtre ; chez le ♂, le clypéus est jaune, assez étroitement noir à la base, le labre est jaune, taché de ferrugineux ou entièrement ferrugineux. Ailes légèrement enfumées dans leur partie distale chez les ♀♀, plus nettement, dans leur partie centrale, chez les ♂♂.

Cette race est bien distincte de la subsp. *soror* Dahlbom, beaucoup plus claire, que l'on rencontre en Basse Egypte. Elle est par contre très semblable à la race du Maroc, dont elle se distingue par une taille un peu plus grande et les dessins clairs encore plus réduits.

Genre Stizus Latreille

L'étude des *Stizus* s.s. présente de grandes difficultés ; plusieurs espèces, en effet, ne se distinguent que par de minimes caractères morphologiques et présentent d'autre part une variation géographique et individuelle très éten-

due, affectant surtout la coloration. Un nombre certainement trop grand d' « espèces » ont été décrites de l'Afrique du nord et l'établissement des synonymies demandera un travail considérable, que je n'ai qu'ébauché pour l'instant. C'est dire que les noms donnés ici devront dans certains cas être changés par la suite.

La collection Omer-Cooper comprend un assez grand nombre de spécimens, qui se rattachent à 8 espèces. Plusieurs d'entre elles semblent former dans la région de Siwa une race locale, caractérisée soit par le mélanisme (*succineus*), soit par le rufinisme (*pubescens*, *rapax*, *cheops*). Je décrirai ici ces formes sans les nommer, attendant pour celà de mieux connaître la variation géographique des diverses espèces, et évitant ainsi d'introduire des noms nouveaux dans un genre où ceux-ci sont déjà trop nombreux.

12. Stizus vespoïdes Walker

Localités : Siwa, 22.vi, 2 ♀♀ ; 4.vii, 1 ♀ ; 14.vii, 1 ♀ ; 15.vii, 1 ♀ ; 16.vii, 1 ♀ ; 19.vii, 2 ♀♀. 29.vii, 1 ♀ ; 31.vii, 1 ♀ ; 22.viii, 5 ♀♀. Maragi, 14.viii, 1 ♂. Gara, 3.vii, 1 ♀. Baharein, 9-10.vi, 1 ♀ ; 11-12.vi. 1 ♂.

Distribution : Afrique du nord, dans la région saharienne surtout.

Remarques : Espèce à morphologie et coloration bien caractéristiques. Chez les spécimens de Siwa, le thorax et le propodéum sont entièrement ou en grande partie ferrugineux.

13. Stizus succineus Klug

Localités : Siwa, 29.vi, 1 ♂ ; 13.vii, 1 ♂ ; 14.vii, 1 ♂ ; 16.vii, 3 ♂♂ ; 17.vii, 3 ♀♀ ; 25.vii, 1 ♀ ; 31.vii, 1 ♀ ; 13.viii, 1 ♀ ; 21.viii, 1 ♀. Maragi, 14.viii, 1 ♂. Khamissa depression, 19.vii, 1 ♀. Baharein, 12.vi, 6 ♂♂. Sitra, 15.vi, 2 ♂♂. Lake Shiata, 2.viii, 1 ♀.

Distribution : Afrique du nord, dans la région saharienne.

Remarques : L'espèce est bien caractérisée morphologiquement par la sculpture, la pilosité et la forme du dernier tergite, la structure du clypéus, la ponctuation des sternites, etc. Les individus de Siwa se distinguent de ceux de la vallée du Nil, ainsi que de ceux que j'ai examinés d'In Salah et de Colomb Béchar, par la coloration plus foncée de l'abdomen. Le premier tergite est d'un noir-brunâtre et porte sur le milieu du disque une tache plus ou moins grande, à contours souvent peu nets, parfois divisée par une ligne longitudinale médiane ; suivant les exemplaires, cette tache est ferrugineuse ou jaune. Les côtés du 2e tergite sont d'un noir-brunâtre (comme chez *vespoïdes*) et cette couleur forme également des bandes, plus ou moins larges et plus ou moins découpées, sur les tergites suivants. Chez la ♀, la couleur jaune du 5e tergite se trouve ainsi réduite à une bande basale assez étroite et le 6e tergite est entièrement d'un noir plus ou moins ferrugineux. Chez

les ♂♂, les derniers tergites sont aussi plus ou moins obscurcis ; certains exemplaires montrent, dans la bande jaune des tergites 2-5, une paire de taches brunâtres, à contours mal définis ; ces taches peuvent aussi manquer ou se souder à la bande terminale. Un des ♂♂ (du 16.vii) présente un mélanisme beaucoup plus accusé encore : son abdomen est presque entièrement noir, avec des petites taches médianes, d'un ferrugineux foncé, sur les tergites 1, 2 et 4 ; son 3e tergite montre 2 petites taches jaunes en croissant, réunies par une petite zone ferrugineuse ; son 7e tergite est ferrugineux. Chez tous les exemplaires, la face ventrale de l'abdomen est très obscurcie et la coloration ferrugineuse est très étendue sur le thorax.

14. Stizus hyalipennis Handlirsch

Localité : Siwa, 22.vi, 2 ♀♀.

Distribution : Afrique du nord, dans la région saharienne.

Remarques : L'espèce que Mochi (1939) décrit sous ce nom est très probablement *St. annulatus* Klug. Le vrai *hyalipennis* Handlirsch, dont j'ai examiné les types, ne présente pas de fossette scutellaire chez la ♀ et fait donc partie, par ce caractère, du groupe de *fasciatus*. Parmi les espèces de ce groupe, il est caractérisé entre autres par ses ailes entièrement hyalines, sa pilosité blanche très fournie, ses dessins jaunes très développés, ses gros ocelles, les fines épines du peigne de la ♀.

15. Stizus saharae Roth

Localité : Lake Shiata, 2.viii, 1 ♀.

Distribution : Afrique du nord, dans la région saharienne.

Remarques : Cette ♀ appartient sans doute à la forme décrite sous ce nom par Roth (1934), mais il est probable qu'elle doive se rattacher subspécifiquement à une espèce plus anciennement décrite. Les ailes présentent l'obscurcissement caractéristique ; l'abdomen est noir avec les tergites 1 et 2 en grande partie ferrugineux.

16. Stizus cheops Morice

Localités : Siwa, 18.vii, 1 ♀ ; 31.vii, 2 ♀♀ ; 21.viii, 1 ♂. Siwa, Zegawa, 8.v, 1 ♂. Siwa, Ilrhabit Nachou, 15.v, 1 ♂. Siwa, Ultabu Tamrabut, 14.v, 1 ♀. El Arig, 7.vi, 8 ♂♂. Baharein, 12.vi, 2 ♂♂. Sitra, 15.vi, 1 ♂. Lake Shiata, 2.viii, 2 ♀♀.

Distribution : Basse Egypte. Biskra (*marthae* Handl.).

Remarques : Ces spécimens de Siwa sont en moyenne plus grands que ceux de Basse Egypte. Les bandes terminales noires des tergites sont larges et les tergites 1-2 sont plus ou moins envahis par du ferrugineux.

Il me semble que *St. cheops* doit être rattaché subspécifiquement à *St. marthae* Handlirsch, de Biskra, de coloration beaucoup plus claire, mais présentant des caractéristiques morphologiques identiques. Notons ici que l'espèce nommée *marthae* par Mochi n'a rien à voir avec le vrai *marthae* de Handlirsch et qu'elle correspond peut être à *St. lepidus* Klug.

17. Stizus pubescens Klug

Localités : Siwa, 24.v, 1 ♀ ; 21-22.vii, 1 ♀ ; 31.vii, 1 ♀ ; 14.viii, 1 ♂ ; 19.viii, 1 ♂. Baharein, 11.12.vi, 1 ♂.

Distribution : Pourtour de la Méditerranée ; n'a pas été cité avec certitude d'Egypte, mais il est fort possible que l'une ou l'autre des espèces citées ou décrites de ce pays se rattache en réalité à *pubescens*.

Remarques : Cette espèce a une grande aire de répartitoin et présente une variation géographique qui affecte la densité de la ponctuation et surtout la coloration. La forme typique (d'Espagne) est noire avec des dessins jaunes relativement peu développés. Dans certaines régions de la Méditerranée orientale, à Chypre par exemple, on trouve une race chez qui les dessins noirs des premiers tergites sont remplacés par du ferrugineux. L'Afrique du nord-ouest (Maroc, Biskra) est habitée par la subsp. *arenarum* Handlirsch, sans coloration ferrugineuse, mais avec des dessins jaunes plus développés que chez la forme typique.

Les individus de Siwa m'ont paru morphologiquement identiques à ceux des autres régions ; sont en tous cas semblables : les proportions des diverses parties de la face (clypéus, écusson frontal, largeur du front, etc.), la dense brosse de poils des fémurs 2 et 3 du ♂, la forme du dernier article des antennes, l'armature génitale ; la sculpture est semblable à ce que l'on voit chez *pubescens arenarum*. La coloration, par contre, est assez particulière : les dessins clairs ne sont pas jaunes, mais ferrugineux, plus foncé sur le thorax, plus jaunâtre sur la tête et sur l'abdomen. Les tâches des tergites sont plus petites que chez *pubescens arenarum* et à contours moins nettement définis ; les sternites sont en grande partie noirs.

18. Stizus rapax Handlirsch (?)

Localité : Baharein, 12.vi, 2 ♂♂.

Distribution : Basse Egypte, Biskra.

Remarques : Handlirsch a décrit d'Egppte une ♀ de cette espèce et il y rattache un ♂ avec un certain doute. J'ai vu ces types, mais je ne puis affirmer pour le moment que ce sont bien les deux sexes d'une même espèce. Comme le signale Handlirsch, le ♂ se distingue de celui de *pubescens* par la ponctuation plus dense et plus fine du mésonotum, ainsi que

par les antennes en partie obscurcies en dessus. J'ai retrouvé à Biskra des ♂♂ semblables et je puis noter qu'ils se distinguent encore de *pubescens* par les ocelles plus gros, séparés de l'œil par une distance inférieure à leur propre diamètre, par l'absence de la dense brosse de poils des fémurs 2 et 3 du ♂, remplacée par une fine pruinosité, d'où sortent quelques poils isolés plus longs et par les valves de l'armature génitale beaucoup moins tronquées à l'extrémité.

Les 2 ♂♂ de Siwa présentent ces diverses particularités morphologiques, mais ont un abdomen bien différemment coloré, sans couleur jaune. Les tergites 1 et 2 sont ferrugineux, à bord postérieur noir, le 3e tergite est noir avec deux taches ferrugineuses à la base (jaunâtres au milieu chez un des exemplaires) ; 4e tergite noir, avec des ombres ferrugineuses ; 5e tergite noir, avec des ombres ferrugineuses chez un des individus, avec deux taches ferrugineuses à l'extrémité chez l'autre ; 6e tergite en grande partie ferrugineux, le 7e entièrement. Sternites 1-3 et 6-7 en grande partie ferrugineux, 4-5 en grande partie noirs. Sont ferrugineux sur le thorax : des bandes latérales au mésonotum, le scutellum, le postscutellum, l'extrémité de l'aire dorsale et la plus grande partie des faces latérales et postérieures du propodéum. Tête et prothorax tachés de jaune plus ou moins ferrugineux. Antennes obscurcies au milieu sur leur face supérieure.

19. Stizus fuliginosus Klug

Localité : Siwa, 19.viii, 1 ♂.

Distribution : Afrique du nord, dans la région saharienne. Asie mineure.

Genre Sphecius Dahlbom

20. Sphecius claripennis Morice

Localités : Siwa, 15.vii, 1 ♂ ; 16.vii, 1 ♂ ; 18.vii, 1 ♀ ; 21-23.vii, 1 ♂ ; 22.viii, 1 ♂. El Arig, 8.vi, 1 ♂ ; 18.vi, 1 ♀.

Distribution : Sud Algérien. Tunisie.

Remarques : Ces spécimens sont morphologiquement semblables à ceux de Biskra (loc. typ.), mais de coloration plus foncée. La base des tergites est plus largement noire ; chez les ♂♂, les taches noires des tergites 3-5 sont largement reliées à la bande basale. Chez les ♂♂, le scutellum n'est pas entièrement jaune, mais présente une tache médiane ferrugineuse ou d'un jaune plus ou moins ferrugineux ; le postscutellum est noir ou à peine taché de ferrugineux ; cette coloration rappelle celle d'*hemixanthopterus* Morice. Chez les ♀♀ aussi, les taches du scutellum et du postscutellum sont plus ou moins ferrugineuses. Chez une des ♀♀, le premier tergite est ferru-

gineux dans toute sa partie centrale, avec seulement des petites taches jaunes latérales.

Genre Gorytes Latreille

21. Gorytes (Ammatomus) mesostenus Handlirsch

Localités : Siwa, 3-5, 1 ♂ ; 27-28.vi, 1 ♀ ; 9.vii, 1 ♀ ; 13.vii, 1 ♀ ; 25.vii, 1 ♀, Siwa, Ilrhabit Nachou, 15.v, 1 ♂. Siwa, Ultabu Tamrabut, 14.v, 1 ♀. Siwa, Tagzerti, 13.vii, 6 ♂♂, 1 ♀. Maragi, 14.viii, 1 ♀ ; 26.viii, 1 ♂.

Distribution : Basse Egypte. Cyrénaïque.

Genre Larra Fabricius

22. Larra anathema Rossi

Localités : Siwa, 2.vi, 1 ♂ ; 29.viii, 1 ♂.

Distribution : Pourtour de la Méditerranée.

Genre Liris Fabricius

Je comprends dans le genre *Liris* les espèces autrefois placées dans le genre *Notogonia* Costa.

23. Liris haemorrhoidalis Fabricius

Localités : Siwa, 7.v, 1 ♂ ; 20.v, 1 ♂ ; 2.vi, 3 ♂♂ ; 4.vi, 1 ♀ ; 6.vii, 1 ♀ ; 10.vii, 1 ♀ ; 13.vii, 1 ♂ ; 25.vii, 2 ♀♀ ; 14.viii, 1 ♂ ; 19.viii, 3 ♂♂ ; 20.viii, 1 ♂.

Distribution : Exrtême sud de l'Europe. Méditerranée orientale. Toute l'Afrique. Inde.

Remarques : Ces exemplaires sont de taille moyenne ou faible ; le plus petit ♂ ne mesure que 9 mm.

24. Liris nigricans Walker

Localité : Siwa, 4.vi, 1 ♀.

Distribution : Méditerranée orientale. Toute l'Afrique. Inde

25. Liris memmonia Smith

Localités : Siwa, 12.v, 1 ♀ ; 18.vii, 1 ♀. Baharein, 11.vi, 1 ♂.

Distribution : Afrique du nord, surtout dans la région saharienne. Région éthiopienne.

26. Liris nigrita Lepeletier

Localité : Siwa, Zegawa, 8.v, 1 ♀.

Distribution : Europe sud-ouest. Afrique nord, dans les régions saharienne et méditerranéenne.

27. Liris opalipennis Kohl

Localités : Siwa, 10.v, 1 ♀ ; 20.v, 1 ♀ ; 20-21.vii, 1 ♂. Siwa, Illrhabit Nachou, 15.v, 1 ♂.

Distribution : Décrite de Biskra et d'Oran, mais cette dernière localité est douteuse et représente peut être le Sud Oranais. Je la connais aussi de la Basse Egypte.

Remarques : A côté de *Liris nigra* van der Linden (*pompiliformis* auct.) existent, dans une partie de l'Afrique du nord, au moins deux espèces voisines : *opalipennis* Kohl, et celle que je décris ci-après sous le nom de *cooperi*. Ces 3 espèces ont en commun les caractères principaux suivants : mésopleures mates, finement coriacées ; ♀ : aire pygidiale brillante, à ponctuation espacée ou dense seulement dans sa moitié terminale, sans pilosité couchée dense ; ♀ : fémurs postérieurs simples, sans échancrure à la base et sans gouttière longitudinale en dessous. Je ne suis pas encore au clair sur les rapports qui existent entre ces espèces et celles qui habitent les régions éthiopienne et orientale.

Complément de description : La ♀ d'*opalipennis*, dont j'ai examiné, outre les individus de Siwa, 2 ♀♀ d'Algérie (Biskra et Oran), faisant partie de la série originale de Kohl (Muséum de Vienne) et une ♀ de Basse Egypte, se distingue de celle de *nigra* par divers caractères. Le bord antérieur du clypéus, les scapes, les tarses et l'aire pygidiale sont plus ou moins complètement ferrugineux ; les ailes sont beaucoup moins enfumées, d'un ton légèrement jaunâtre, avec des reflets opalescents (visibles aussi chez *nigra*) et une nervulation d'un ferrugineux clair ; pruinosité argentée un peu plus développée sur les diverses parties du corps, mais absente (comme chez *nigra*) sur les tergites 4-5. D'après Kohl, la distance interoculaire au vertex serait, chez *opalipennis*, presque égale à la longueur des articles 1 + 2 du funicule, tandis qu'elle serait, chez *nigra*, égale à l'article 2 + 1/3 du 3e. Des mesures précises ne m'ont pas permis de confirmer cette assertion ; la distance interoculaire varie un peu chez les deux espèces, en relation avec la taille, et ne permet pas une distinction certaine. Les derniers articles du funicule sont plus courts que chez *nigra ;* l'avant dernier, par exemple, n'est pas tout à fait 2 fois aussi long que large. La sculpture du propodéum est nettement plus fine que chez *nigra ;* les faces latérales, d'aspect soyeux, ne montrent que quelques fines stries dans le haut. La zone qui sépare les dépressions latérales du 2e sternite est en triangle nettement plus large que chez *nigra*, avec une ponctuation plus distincte. L'aire pygidiale est assez large, avec des bords peu élevés, brillante et beaucoup moins ponctuée que

chez *nigra;* il n'y a que quelques points, obliquement enfoncés, le long des bords et quelques points isolés dans la partie postérieure.

Le ♂ était encore inconnu. Il se distingue de celui de *nigra* par les mêmes caractères de coloration des ailes et de la nervulation, de pilosité, de sculpture du propodéum que les ♀♀ ; les différences sont cependant un peu moins nettes. On distinguera par contre facilement le ♂ d'*opalipennis* de celui de *nigra* par la partie antérieure du clypéus brillante (mate chez *nigra*) et par le 2e article du funicule beaucoup plus court, à peine aussi long que large à l'extrémité ; les derniers articles du funicule sont aussi proportionnellement plus courts et plus épais. Il y a quelques petites différences dans l'armature génitale ; ainsi, l'extrémité libre de la volsella est moins élargie.

28. Liris cooperi n. sp.

Localité : Siwa, 7.v, 1 ♀.

Distribution : J'ai examiné 16 ♂♂ et 6 ♀♀ de Basse Egypte (environs du Caire), 2 ♂♂ et 3 ♀♀ de Biskra, 1 ♂ et 3 ♀♀ du Maroc méridional (Marrakech, Tiznit, Zagora).

Description : Espèce très voisine de *nigra* et d'*opalipennis.*

♀. 10-14 mm. Noire ; le clypéus et les scapes peuvent être plus ou moins teintés de ferrugineux sombre ; tarses généralement ferrugineux depuis l'extrémité du premier article ou la base du 2e. Ailes peu enfumées, comme chez *opalipennis*, mais avec une teinte jaune plus accusée ; nervulation d'un ferrugineux clair. Pruinosité argentée nettement plus développée que chez *nigra ;* elle est présente aussi sur les tergites 5 et 6, quoique moins abondante que sur les tergites précédents.

Les derniers articles du funicule sont un peu plus grêles que chez *nigra ;* l'avant dernier est un peu plus de 2 fois aussi long que large. Distance interoculaire comme chez *nigra*, c'est-à-dire supérieure à la longueur du 2e article du funicule, mais inférieure à la longueur des 2 premiers articles réunis. Sculpture du propodéum semblable à celle de *nigra*, la striation cependant un peu moins dense sur les faces latérales ; 2e sternite comme chez *nigra.* Aire pygidiale un peu plus étroite que chez cette espèce, moins bombée à la base, plus nettement bordée, à ponctuation nettement plus dense.

♂. 7-10 mm. Coloration ferrugineuse moins étendue que chez la ♀ ; couleur des ailes et de la nervulation comme chez celle-ci. Pruinosité argentée plus développée que chez *nigra* ♂.

La partie antérieure de clypéus est brillante, comme chez *opalipennis.* Le 2e article du funicule est, comme chez *nigra*, à peu près 1,5 fois plus long que large. Sculpture du propodéum semblable à celle de cette espèce, la striation des faces latérales souvent moins serrée et moins fine. L'extrémité de la volsella un peu plus élargie à l'extrémité que chez *nigra.*

Type : La ♀ de Siwa (British Museum).

Genre Tachytes Panzer

29. Tachytes maculicornis Saunders

Localités : Siwa, 20.v, 1 ♂ ; 24.v, 1 ♂ ; 28.v, 1 ♀ ; 31.v-1.vi, 1 ♀ ; 2.vi, 5 ♂♂, 1 ♀ ; 6.vii, 1 ♂ ; 31.vii, 1 ♀ ; 12.viii, 1 ♀.

Distribution : Décrite de Biskra ; j'ai retrouvé cette espèce dans le Maroc méridional.

Remarques : Comparés à des exemplaires de Biskra, ceux de Siwa sont en moyenne de taille un peu plus forte ; corrélativement, les articles du funicule du ♂ sont légèrement plus dilatés.

30. Tachytes niloticus Turner

Localités : Siwa, 2.vi, 1 ♂ ; 24.vi, 1 ♀ ; 15.vii, 1 ♀ ; 17.vii, 1 ♀ ; 19.vii, 1 ♀ ; 13.viii, 1 ♀ ; 14.viii, 1 ♂.

Distribution : Basse Egypte.

Remarques : Ces spécimens sont semblables à une série d'individus des environs du Caire que j'ai examinés et qui correspondent très exactement à la description de Turner (1918). Je ferai remarquer que la face dorsale du propodéum est finement striée en travers, caractère que l'on remarque surtout chez les spécimens usés, à pilosité en partie arrachée. Le ♂, que Turner n'a pas connu, ressemble beaucoup à la ♀ ; il a cependant les fémurs noirs ; aucun article de son funicule n'est dilaté.

31. Tachytes melanopygus Costa

Localités : Siwa, 28.v, 2 ♂♂ ; 4.vi, 1 ♂ ; 9.vii, 1 ♀ ; 15.vii, 1 ♀ ; 25.vii, 1 ♀ ; 31.vii, 5 ♀♀ ; 9.viii, 2 ♀♀ ; 14.viii, 1 ♂. Siwa, Tagzerti, 12.vii, 1 ♀.

Distribution : Espèce décrite de Tunisie, et que je connais aussi de Biskra, de Lybie et de Basse Egypte.

Remarques : J'ai donné (1937) quelques renseignements sur cette espèce, proche de *ambidens* Kohl, et citée sous ce nom par Morice, de Biskra.

Genre Tachysphex Kohl

Pour les espèces de ce genre, voir : de Beaumont 1947.

32. Tachysphex cheops de Beaumont

Localités : Siwa, 13.vii, 3 ♀♀ ; 19.vii, 1 ♀.

Distribution : Basse Egypte. Cyrénaique.

33. Tachysphex pygidialis Kohl

Localités : Siwa, 11.vii, 1 ♂. El Arig, 7.vi, 1 ♂.

Distribution : Pourtour de la Méditerranée.

Remarques : L'appendice dorsal de la volsella présente la forme typique. Ces individus appartiennent probablement à la subsp. *nattereri* Kohl, caractérisée surtout chez la ♀.

34. Tachysphex mantivorus de Beaumont

Localités : Siwa, 29.vii, 1 ♀; 29.viii, 2 ♀♀. Siwa, Koreishid, 22.viii, 1 ♂ Siwa, Ilrhabit Nachou, 15.vi, 1 ♂. El Arig, 18.vi, 1 ♂.

Distribution : Extrême sud de l'Europe. Palestine. Afrique du nord, dans les régions méditerranéenne et saharienne.

35. Tachysphex grandissimus Gussakovskij

Localité : Lake Shiata, 2.viii, 1 ♂.

Distribution : Asie centrale. Afrique du nord, surtout dans la région saharienne.

36. Tachysphex osiris de Beaumont

Localité : Sitra, 15.vi, 1 ♀.

Distribution : Désert nubique. Cyrénaïque. Sud Algérien.

37. Tachysphex nubilipennis n. sp.

(= *dusmeti* Giner nec de Beaumont)

Localités : Siwa, 29.vi, 1 ♀. El Arig, 8.vi, 3 ♂♂.

Distribution : Gialo. Tripoli. J'ai également examiné 1 ♀ de Tripolitaine : Gat, ix.36, Scortecci, leg. (Muséum de Milan), et 1 ♂ du Maroc oriental : Ksar es Souk, 3.vi.47 (coll. mea). L'espèce semble donc répandue dans la région saharienne.

Remarques : J'ai écrit (loc. cit.) sous le nom de *dusmeti* Giner un *Tachysphex* ♂, en émettant d'ailleurs quelques doutes sur cette détermination. De fait, plusieurs spécimens déterminés *dusmeti* par Giner Mari, provenant d'Espagne, et qui m'ont été communiqués par l'Institut entomologique de Madrid, se sont révélés être des *albocinctus* Lucas. Il serait d'ailleurs singulier de retrouver en Espagne une espèce qui, dans le nord de l'Afrique, semble appartenir uniquement à la faune saharienne. Je donne ici une description complète de l'espèce, qui fait partie du groupe d'*albocinctus*.

Description : ♀. 12,5-13 mm. Noire; la partie médiane des mandibules, une partie des tibias 1 et 2, la plus grande partie des tibias 3 et tous les tarses ferrugineux. Ailes hyalines, à nervures d'un brun clair. Face et

clypéus recouverts d'une pilosité blanche dense, pas régulièrement couchée ; partie postérieure de la tête à pilosité blanche dressée. Thorax entièrement recouvert d'une pilosité semblable à celle de la face, c'est-à-dire de poils couchés longs, un peu feutrés, cachant la sculpture. Propodéum à pilosité blanche très dense aussi, d'aspect laineux, plus ou moins couchée sur la face dorsale, dressée sur le haut des faces latérales ; premier tergite recouvert d'une dense pilosité. Les 4 premiers tergites avec des bandes de pruinosité argentée très développée.

Partie apicale brillante du clypéus moins développée que chez *albocinctus ;* lamelle assez faiblement arquée en avant, sans dents sur les côtés. Le 2e article du funicule est un peu plus long que le 3e, 3,5 fois plus long que large. Sculpture de la face invisible sous la pilosité. Vertex mat, à ponctuation fine et assez dense ; la distance interoculaire n'égale même pas les 2/3 du 2e article du funicule. Tempes très peu développées. La sculpture du thorax, pour autant qu'on puisse l'apercevoir sous la pilosité, est semblable à celle d'*albocinctus*. L'aire pygidiale est un peu plus finement coriacée que chez cette espèce, un peu plus brillante et plus fortement rétércie avant son extrémité. Chez *albocinctus*, les 2/3 basaux du 2e sternite montrent une ponctuation microscopique dense ; chez *nubilipennis*, la ponctuation du 2e sternite est microscopique aussi, mais beaucoup moins dense.

♂. 10-12 mm. Coloration du corps comme chez la ♀ ; celle des ailes et de la pilosité très différente d'où résulte, au premier abord, un dimorphisme sexuel très prononcé. Toute la partie basale des ailes, jusqu'à l'extrémité des cellules, est fortement teintée, d'un brun-jaunâtre ; l'apex est hyalin. La pilosité de la tête et du thorax est presque aussi dense que chez la ♀, mais elle s'arrache facilement, en particulier sur le mésonotum. Cette pilosité est brune, plus foncée sur la tête. Le premier tergite montre également une pilosité brune dense ; pas de pruinosité argentée sur l'abdomen.

Clypéus comme chez *albocinctus*, mais plus fortement ponctué dans sa partie apicale. Distance interoculaire plus courte que la longueur du 2e article du funicule. 7e tergite plus finement sculpté que chez *albocinctus*. Deuxième sternite à ponctuation à peu près régulière sur toute sa surface, avec des espaces un peu plus grands que les points ; chez *albocinctus*, le 2e sternite montre, sauf à son bord postérieur, une ponctuation plus fine et beaucoup plus dense. L'armature génitale des spécimens de Siwa est semblable à celle que j'ai figurée (loc. cit.).

Le dimorphisme sexuel dans la coloration des ailes et de la pilosité est très accusé chez cette espèce ; on retrouve un phénomène semblable chez deux autres espèces sahariennes : *T. longipalpis* de Beaumont et *isis* de Beaumont. Les individus des 2 sexes se distinguent facilement de ceux d'*acbocinctus* par la pilosité plus développée, la zone apicale brillante du clypéus moins

étendue, la distance interoculaire plus faible, la sculpture plus fine du dernier tergite, la ponctuation du 2e sternite ; le ♂ de plus à la coloration de ses ailes, la ♀ à l'absence de petites dents au bord antérieur du clypéus.

38. Tachysphex schmiedeknechti Kohl

Localités : Khamissa, 4.v, 1 ♂ ; Sitra, 15.vi, 1 ♀.

Distribution : Méditerranée orientale. Afrique du nord, dans les régions méditerranéenne et saharienne.

39. Tachysphex vestitus Kohl

Localité : El Arig, 7.vi, 1 ♂.

Distribution : Afrique du nord, dans la région saharienne.

40. Tachysphex nitidior de Beaumont (?)

Localité : Siwa, Zegawa, 8.vi, 1 ♀.

Distribution : Europe méridionale, Afrique du nord.

Remarques : En présence d'une ♀ isolée, la détermination, dans ce groupe difficile, reste un peu douteuse.

41. Tachysphex cabrerai Mercet

Localités : Siwa, 28.v, 4 ♂♂, 1 ♀. Khamissa, 27.vi, 2 ♀♀.

Distribution : Pourtour de la Méditerranée.

Remarques : Ces spécimens se distinguent nettement de ceux des autres régoins par leur taille un peu plus forte, la ponctuation des diverses parties du corps plus nette et plus dense, en particulier sur le mésonotum, où les points sont gros, séparés par des espaces très étroits ; ils sont surtout caractérisés par la face dorsale du propodéum, qui montre des stries longitudinales nettes et plus ou moins régulières. La structure des antennes, la sculpture de la face, la forme générale de la volsella restent cependant caractéristiques, et je pense donc que ces individus de Siwa représentent une race locale de *cabrerai*, espèce qui présente d'ailleurs une variation géographique étendue.

Genre Gastrosericus Spinola

42. Gastrosericus waltlii Spinola

Localités : Siwa, 24.vii, 1 ♂ ; 31.vii, 1 ♂. Baharein, 13.vi, 1 ♀.

Distribution : Afrique du nord, dans les régions méditerranéenne et saharienne.

Remarques : Les *Gastrosericus* nord africains du groupe de *waltlii* appartiennent à divers types, caractérisés par quelques détails de sculpture

et par la coloration de l'abdomen, qui peut être noir ou plus ou moins rouge. Je ne sais pas actuellement si ces formes correspondent à de bonnes espèces. Les ♂♂ de Siwa ont l'abdomen noir, la ♀ a l'abdomen en bonne partie rouge. Au Maroc aussi, on trouve des ♂♂ noirs associés à des ♀♀ ayant l'abdomen en partie rouge.

Genre Miscophus Jurine

43. Miscophus manzonii Gribodo

Localité : Siwa, 18.vii, 1 ♀.

Distribution : Afrique du nord, dans la région saharienne.

Remarques : Il s'agit de cette espèce, telle que la définit Honoré (1944).

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Deux nouveaux Coléoptères d'Egypte et Nubie

par Maurice Pic.

Potamodytes bispinosus nov. spec. [Parnidae]

Angustatus, postice attenuatus, pruinose pubescens, paulo nitidus, nigro-fuliginosus, articulo primo antennarum testaceo, secundo parum obscuriore, femoribus ad basin paulo rufescentibus, unguibus testaceis. Capite minute et dense punctato, oculis grandis, prominulis ; antennis brevibus, parum latis, articulo secundo robusto, tertio paulo elongato, sequentibus diverse transversis et subpectinatis, ultimo subtriangulare ; thorace parum breve, elytris angustiore, antice transverse subsinuato, sulcato, lateraliter subsinuato, postice sinuato, angulis posticis latis, paulo prominulis, minute et dense punctato ; scutello fere triangulare, dense punctato ; elytris elongatis, lateraliter subsinuatis, postice attenuatis, apice in singulo parum longe spinoso-mucronatis, ad basin et infra humeros paulo impressis, minute et multi striato-punctatis, intervallis non dense punctatis ; pedibus elongatis, femoribus parum crassis, tibiis canaliculatis, tarsis gracilibus. Long. 7 mill.

Holotype : Goutha (au nord d'Abou-Simbel, Nubie égyptienne), 2.iv.1931 (collection A. Alfieri, leg. Prof. Dr. H. Priesner). Un deuxième exemplaire, capturé à Choubrah (Caire), le soir à la lampe, 5.vi.1949, figure dans la collection du Ministère de l'Agriculture.

Très distinct de *Potamodytes subrotundatus* Pic par le sommet de chaque élytre en pointe. Paraît voisin de *Potamodytes mucronatus* Del. (ex description), mais l'apex des élytres est plus droit sur la suture, la coloration est plus sombre, non olivâtre.

Priocleromorphus nov. gen. [Cleridae]

Corpus angustatus ; parallelus. Palparum articulis ultimis diverse cylindricis ; antennis elongatis, gracilibus, articulis tribus ultimis dilatatis, clava formantibus, 9° et 10° subtriangulatis, 11° fere ovato. Capite elongato, oculis sat minutis, transversis, antice emarginatis ; thorace elongato, postice breve strangulato, elytris incallosis, flavo-eburneo fasciatis ; pedes parum crassis,

femoribus anticis latioribus, tarsi 4-articulatis, unguibus ad basin paulo dilatatis.

Ce nouveau genre, proche de *Prioclerus* Hintz, est établi pour l'espèce nouvelle suivante :

Prioclеromorphus flavofasciatus nov. spec.

Angustatus, parallelus, nitidus, longe fusco hirsutus, elytris apice paulo breve griseo pubescentibus, diversicolor. Capite nigro-metallico, antice rufo, elongato, fortiter et dense punctato, in medio paulo breve, mandibulis apice nigrescentibus, palpis rufis, antennis nigris, ad basin rufis, articulo 2° sat breve, 3° longissimo, 4° breviore, 5°-8° diverse elongatis, pro parte globulosis, tribus ultimis clava lata formantibus ; thorace rufo, antice supra transverse nigro-metallico, elongato, lateraliter fere recto, postice curte strangulato et elytris valde angustiore, diverse fortiter punctato, medio et postice pro parte impunctato, supra lateraliter paulo compresso, in disco longe impresso ; scutello breve, rufo ; elytris viride-metallicis, ad medium violaceo tinctis, post medium transverse et anguste albo-luteo fasciatis, fascia pro parte elevata, his elongatis, parallelis, apice breve attenuatis, ad et post scutellum impressis, antice fortiter lineato-punctatis, postice minute punctatis, ad apicem paulo impressis et vage griseo pubescentibus ; pectore et abdomine nigris, pro parte albo pubescentibus ; pedibus rufis, tibiis ad basin nigris, tarsis pro parte brunneis. Long. 9 mill.

Holotype : Boulac (Le Caire), 11.v.1941 (collection A. Alfieri).

Espèce très différente de coloris (si non de forme) du *Prioclerus versicolor* Hintz, originaire de l'Usambara, ce dernier ayant les élytres munis de deux fascies flaves, tandis que la base est plus claire que le reste du fond, avec, en surplus, des callosités sur les élytres, que ne possède pas la présente espèce.

Contributions towards a knowledge of the Thysanoptera of Egypt, XV

(with 14 Illustrations)

by Prof. Dr. H. PRIESNER

39. NEW SPECIES AND NEW RECORDS

Sericotrips kassimianus spec. nov.

(Figs. 1-5)

Female : Lemon yellow to pale orange, with light grey shadings on various parts of the body, e.g., sides of head, hind margins of pronotum, on mesonotum, sides of tergite I, the whole tergites II and III, and VI to VIII, and scarcely IX ; a blackish line on fore margins of tergites II to VII ; sometimes also the posterior portion of the metasternum, particularly the hind angles, shaded with grey ; eyes blackish, ocelli vividly red ; antennae with joints 1 to 3 whitish yellow, 4 as well, but very slightly shaded in distal half, 5 pale in basal half, rest slightly darkened, 6 to 8 pale grey, 6 somewhat paler basally. Fore femora scarcely shaded at exterior margins, middle and hind femora light grey at least about middle ; tips of tarsal plates blackish. Wings with extreme base and scale (the latter exclusive of hyaline tip) distinctly greyish, followed by a broad pale band ; from the beginning of the second third, the wings are shaded, but gradually paler towards tip ; the dark longitudinal vein, also on hind wings, conspicuous. Bristles pale.

Head broadest across convex eyes, cheeks straight, narrowed towards base ; a not very conspicuous, though visible, transversal line separates a reticulated occipital area from the rest of the vertex ; this reticulation consists of transverse areolae, while the sculpture behind eyes is formed by anastomosing lines ; hind margin of vertex ill-defined ; in ventral aspect, the head is evenly narrowed towards apex of mouth-cone, the latter very little surpassing base of prosternum ; setae barely visible owing to their pale colour. Antennae somewhat varying in length, total length 286-304 μ ; lengths (widths) of joints, 20-21(25), 36(27), 65(17), 52(17-18), 46(15), 50(14), 10-11(5), 11-14(4) μ, in larger specimens, 22, 36, 62-66, 57, 49, 56, 11, 14 μ ;

joints 3 and 4 constricted at apex, sense-cones forked, long; joint 5 broad at apex. Median pronotal plate emarginated in front, not dark, its fore angles protruding; anterior and lateral portions of pronotum with coarse reticulation; there are 10-12 meshes along median line. Tergites of pterothorax with very fine sculpture. Wings, as usual, very narrow, the single vein with regular row of bristles (3 + 22-25), as indicated in fig. 3, on the place of the lower vein, there is no bristle before apex of wing; costa with about 1 + 25 bristles. Microtrichia well developed at sides of segments I to VII of abdomen, inconspicuous about middle, especially on anterior segments. The median pair of bristles on tergites conspicuous, those on posterior segments longer than on anteriors, having their elements somewhat more widely separated; tergites shorter medianly than laterally; the blackish transversal lines not coinciding with fore margins, but representing internal thickenings, situated behind them; postero-marginal comb (on tergites I to VIII) wanting in the middle of tergite I to VI, being uniform at middle of VII and VIII, but composed of alternatingly longer and shorter comb-hairs, at the sides of these segments; median bristles of tergites V and VI arising shortly from behind the dark transversal line, on VII exactly from it, on VIII from the middle of the segment; in all instances, these median bristles surpass hind margin of tergites; tergite IX with four pairs of anterior and five pairs of posterior setae which are posited on different levels. Segment X not split. Legs, as usual, slender.

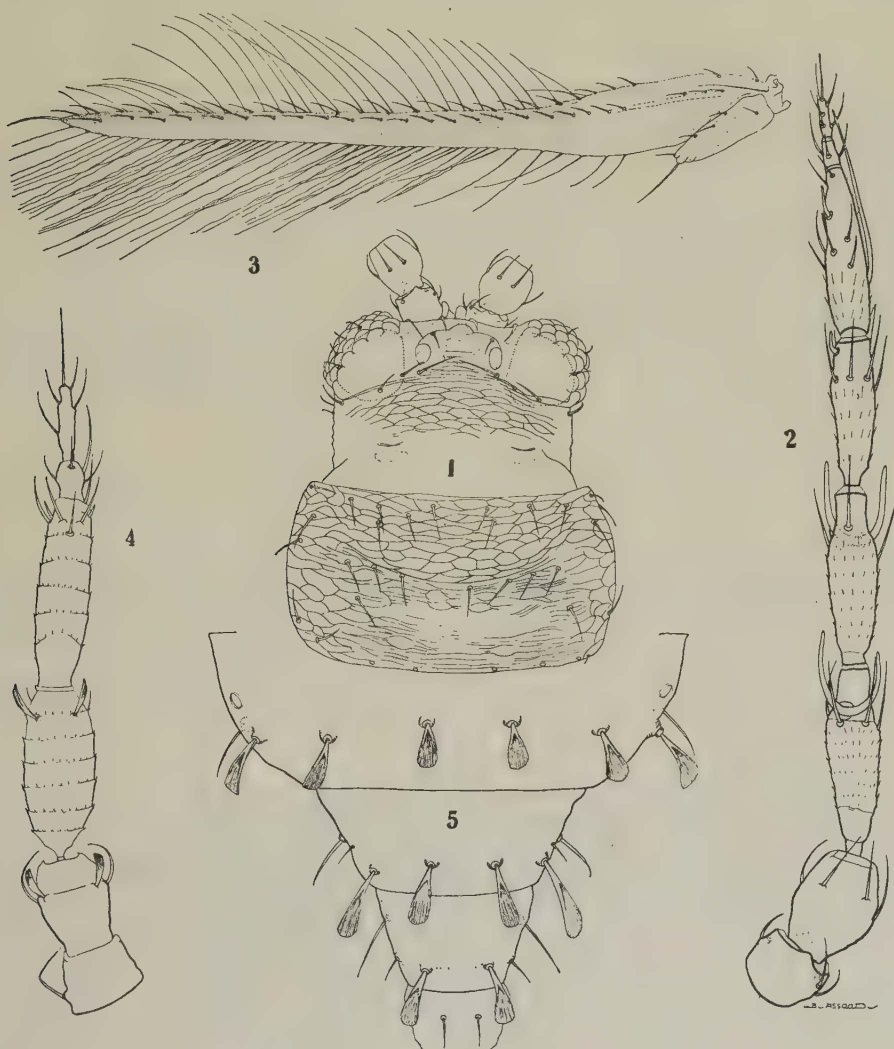
Measurements in μ : Head, width across eyes, 156; across cheeks, 142; eyes, lateral diameter, 58. Pronotum, length 100-108, length of reticulate anterior portion, 48, pronotum breadth, 200. Pterothorax length 208-216, breadth, 234-242. Wings length, 657, width behind scale, 62. Tergite VIII, median length, 52; median dorsal bristles on VII and VIII, 48; b.1 on tergite IX, 56-60, on X, 52-56. Hind tibiae length, 216.

M a l e : Colour exactly as in female, but in some specimens paler; sometimes, tergite IX even more strongly shaded, and femora as dark as in female. Chaetotaxy similar, though differing on segment IX; this bearing six pairs of bristles, one of them at the sides, near middle, another laterally, somewhat more forward, the rest (four pairs) more backward; in some cases it appears, as if three pairs (inclusive of the median setae) were situated somewhat more in front, than the remaining three pairs. Upper vein of fore wing with 3 + 17 to 3 + 19 bristles. Glandular areas on sternites are not discernible, though they may be present.

Measurements of a l l o t y p e, in μ : Head, width, 144. Antennal joints, 20(25), 34-35(25), 56(17), 50(15), 42(13), 50-53(13), 10(6), 11-13(4). Pronotum length, 96, width, 176, Pterothorax width, 208. Wings length, 128-132. Median bristles, b.1, on segment IX, 52-56.

Larva

II. Stage : Whitish yellow; antennae for the major part (excepting joint 2 which is somewhat darker) and body bristles very pale grey; terminal,



Sericothrips kassimianus spec. nov. :

Fig. 1 : Head and prothorax of female. — 2 : Antenna of female. — Fig. 3 : Fore wing of female. — Fig. 4 : Antenna of larva, 2nd stage. — Fig. 5 : End of abdomen of larva, 2nd stage.

antennal joints not darker; tibiae very little shaded basally, being here somewhat darker than femora; eyes dark purplish.

Head large, evenly broadly rounded in front, eyes fairly far back. Width

across eyes 92-95 μ, Antennae very slender, especially joint 3 and terminals (fig. 4), joint 3 sometimes somewhat narrower than shown in this figure. Head immediately before eyes with a pair of the characteristical fanshaped bristles, about 16-18 μ in length; there is evidently no bristle on the constricted part behind eyes. Chaetotaxy of antennae as shown in fig. 4. Measurements of antennal joints : 14-17(22), 31-32(22), 53-56(20), 56(17), 11(9), 22-24(5) μ. Prothorax (width 168 μ) with seven pairs of fringed fanshaped bristles as illustrated previously for *Zonothrips karnyi* (Treubia VIII, Suppl. Taf. V, fig. 8a), bristle 1, 3, 5 and 6 behind one another, b.2 and 4 on fore and hind margin, respectively; lengths of these bristles 16-22 μ. Bristles on mesonotum in three groups, four bristles each, i.e., six pairs altogether. Metathorax with only four pairs of bristles, as there are, laterally, only two bristles on either side. Segments I and IX, as usual, with four, segments III to VIII with six stout bristles, X with one pair of pale bristles of the same type (fig. 5). Bristles 1 and 2 of segment IX about 24 and 28 μ in length, respectively.

Habitat: Egypt, Helwan, 14.x.1935, on leaves — particularly on their under side — of *Cynanchum acutum* L. (Asclepiadaceae), causing yellow spots.

A unique specimen of this insect was first discovered by Mohammed Eff. Kassim of the Entomological Section, Ministry of Agriculture, on the occasion when our collector Farag took some caterpillars feeding on *Cynanchum* leaves of chlorotic appearance. A further search revealed that the thrips was locally common, damaging the leaves of this *Cynanchum*. Most likely confined to the family Asclepiadaceae, this insect is so far of no economic importance.

As to its systematic position, it cannot be confused with any of the European or African species owing to its pale colour and many other, though less apparent, characters. Among the pale species with dark markings, *S. occipitalis* Hood seems to be most closely related, agreeing well even in the measurements of the antennae; but the dark occipital region (vertical region dark brown), the closely adpressed pair of setae near the posterior angles of the pronotum, and the divided abdominal segment X, easily separate *occipitalis* from the new species. My friend, Prof. J. D. Hood (Cornell University, Ithaca) to whom I had forwarded specimens for comparison with the types of *occipitalis*, tells me that the new species "is very distinct from *occipitalis*."

Eremiothrips gen. nov.

(Figs. 6 and 7)

Antennae 9-segmented, joints 6 and 7 forming a unit. Sense-cones on 3 and 4 simple. Head not produced in front, eyes large, ocelli well developed,

cephalic setae vestigial. Mouth-cone normal, maxillary palpi slender, two-segmented, with very long joint 2. All body bristles pale. Prothoracic bristles very minute. Pterothorax short, broad. *Wings broad*, with very conspicuous veins, a distinct cross-vein between costa and upper vein, about middle of wing, another in basal fourth between upper and lower vein. Shape of wing not dendrothripoid. Costa with conspicuous setae and cilia, bristles on veins inconspicuous and scarce. Legs slender, especially the tarsi. Abdomen without microsetulae, without dorsal bristle-pair. The stout, hyaline bristles on segment IX and X moderately long, segment X not split above, rounded apically.

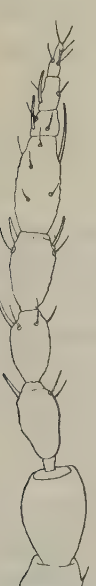
Typus generis : *Eremiothrips imitator* sp.n.

This genus comes close to *Scirtothrips* Shull. It differs by the simple sense-cones, the structure of the wings, which are much heavier than in *Scirtothrips*, the much less conspicuous prothoracic bristles, and, in the case the segmentation of the maxillary palpi proves to be constant, also by the 2-segmented maxillary palpi.

Eremiothrips imitator spec. nov.

(Figs. 6 and 7)

Female : Pale yellow, eyes black, tips of mouth-cone and tarsi with black point. Antennae with joint 1 hyaline, the rest very pale grey. Wings and all bristles colourless.



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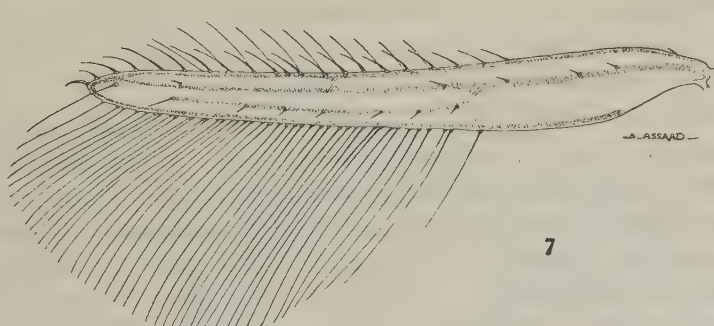

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Eremiothrips imitans gen. et spec. nov. :
Fig. 6 : Antenna of female. — Fig. 7 : Fore wing of female.

Structure of cuticle as in *Scirtothrips*. Head short, strongly transverse, nearly truncate in front, eyes occupying about half of sides of head, coarsely facetted (6 to 7 facets visible at margin); ocelli in equilateral triangle, cheeks somewhat narrowed towards base; cephalic setae vestigial. Maxillary palpi very slender, joint 2(2+3) long. Antennae *short*, slender, joint 2 heavy, barrel-shaped, 3 slender, 3 and 4 with one small sense-cone, 5 much widened towards apex, but narrowed in apical fourth, 6 and 7 separated by an oblique, complete ring-suture, but in outline forming a unit, 7 and 8 much longer than broad, slender. Prothorax broader than head, sides very slightly rounded, broadest about basal third; prothoracic bristles (postero-angulars) minute, hyaline, the interior one 12 μ. Pterothorax much broader than prothorax. Wings broad, veins very conspicuous but hyaline, *costa without setae in basal third or fourth*, remaining portion with 19 to 21 rather stout, hyaline bristles; fringe hairs present in the two apical thirds; upper vein with 4 basal and 2 apical, lower vein with 6 to 7 hyaline bristles which are small (apical lower vein bristle longest). Legs slender, tarsi very slender. No comb on tergite VIII. Bristles on end of abdomen rather short.

Measurements in μ : Head length, 88, width across eyes, 140-145, eyes length (laterally) 54-56; antennae length, 188, lengths (breadths) of joints : 14 ?, 31-32(21), 28(12), 22-23(14), 27(14), 29(14), 8(8-9), 10(6), 13(4). Prothorax length, 104-107, width 172-176. Pterothorax length, 208, width 225-242. Wings length, 588, width, 64-68; length of costal bristles about middle of wing 28-30. Hind tibiae length, 140. Bristles on abdominal segment IX, 44-48, on X, 36-40. — Total body length (slightly distended): 0.95-1 mm. — Male unknown.

This species is at first sight rather similar to *Scirtothrips antilope* Pr., but the much shorter prothoracic and alar bristles, and the thick wing veins will distinguish it even at low magnification.

Habitat : Egypt, Wadi Bahr el-Bellama, May 4, 1932, on *Haloxylon schweinfurthii* Asch. I only know two females, the description of which I had held back awaiting further material, especially the other sex. In spite of repeated visits to the exact spot where I found these specimens, I could not capture any further ones. *Haloxylon* does not seem to be a host plant of *Eremiothrips imitator*.

Exothrips tenellus spec. nov.

(Figs. 8 and 9)

Female : Pale yellow, eyes black, ocelli crimson, tips of mouthcone and of tarsi black. Antennae and legs pale yellow, distal third of joint 6 and joints 7 and 8 slightly shaded with grey-brown. *Extreme apex of segment X of abdomen grey-brown.* Wings pale.

Head broader than long, not produced in front, broadest across eyes, narrowed towards base, cheeks straight; eyes large, 2nd and 3rd cornea of ommatidia yellow, larger than the rest of the cornea; mouth-cone short, broadly rounded. Head without major setae. Antennae normal, sense-cones fine, those on 3 and 4 forked; joint 5 rather long, narrowed from middle to apex, 6 constricted basally, 7 and 8 slender. Prothorax slightly widened towards base, moderately broad, bristles pale, exterior postero-angular well developed, about 22 to 25 μ, interior one short, 14 μ, adpressed, and directed inward; postero-marginals (within) four pairs in number. Pterothorax elongate, wings very narrow, rather straight, *veins quite indistinct*, costa with 16-18 widely spaced bristles, upper vein with 3+3 basal, and 1+2 distal, *lower vein with only four bristles;* scale at suture with *four* bristles; wing

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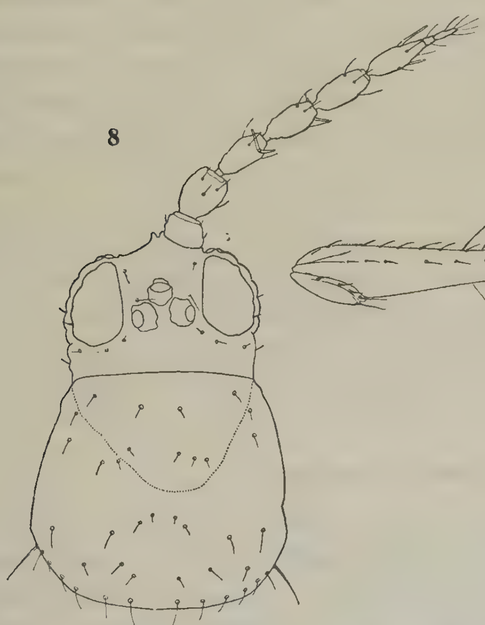

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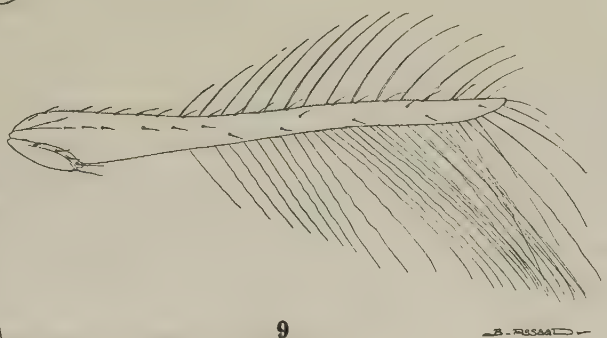

Exothrips tenellus spec. nov.
Fig. 8 : Head and prothorax of female. — Fig. 9 : Fore wing of female.

bristles clear, moderately long. The four setae of the metascutum situated close to fore margin. Fore femora somewhat incrassate. Abdomen slender, normal, without microsetulae; sternites without accessory bristles, hind margins with three pairs of bristles; tergite VIII without comb, dorsal bristles of tergite IX well developed, 34 to 40 μ, terminal bristles of IX and X long.

Measurements of holotype (in μ) : Head length, about 70, width across eyes 106, diameter of eyes 50-53; antennae length 200; lengths (breadths)

of joints : 14(21), 29(20), 31-32(14), 31(15), 34(15), 38(12), 7(5), 10(3). Pronotum length (width), 120(138). Width of fore femora, 70. Pterothorax length (width), 180(162). Wings length, 480, breadth behind scale, 48, across middle, 27. Bristles on segment IX, b.1, 60; b.2, 92-100; dorsals, 34-40; bristles on X, b.1, 2, 88-92. Segment IX, length, 76, width at base, 78; segment X, length (width), 72(52). — Total body length (normal distension) : 0.89 mm.

Habitat : Egypt, Meadi, Nov. 14, 1937, from Halfa grass (*Imperata cylindrica*), leg. H. Priesner.

The unique specimen, a perfect mount, is of *Anaphothrips* habitus. As to its characters, I can only compare it with *Exothrips monstrosus* Pr. from the Belgian Congo (*Rev. Zool. Bot. Afric.*, 32, 1939, p. 163, figs. 4 and 5). The general appearance, the somewhat incrassate fore femora, the form of the wings, and their chaetotaxy, as well as that of the terminal abdominal segments, show it to be closely allied to this species. In any case, it seems to come nearer to it than to *Anaphothrips*. It is readily distinguished from it by the colour and form of the antennae which are much slenderer and paler too (in *monstrosus*, joint 3 is very short), by the longer prothoracic bristles, and it differs in having four, instead of five, setae at the scale suture of the fore wing. When the male will have been discovered, this species might, however, still turn out to be generically different from *Exothrips monstrosus*. From the species of *Exothrips* described by Jacot-Guillarmod (*Journ. Ent. Soc. South Afr.*, IV, 1941, pp. 83-93), it comes nearest to *setosus*, but differs by the much narrower antennal segments.

Taeniothrips zillarum spec. nov.

Female : Pale yellow, body and legs without any shadings; eyes, parts of rostrum and of tarsal plate, and major bristles of body shaded, these parts being, therefore, visible on a white substratum. *Antennae rather dark:* Joint 1 hyaline, 2 strongly shaded with grey, 3 whitish yellow in basal half, or more extensively, grey in distal half (or less), 4 almost equal in colour with 3, 5 whitish in basal third, 6 to 8 entirely dark, grey. Wings pale.

About of the size of *Taeniothrips discolor* (Karny). Head short, normal, interocellar setae very small, not more than 12 μ in length; maxillary palpi normal, joints 11-14, 14 and 17 μ long; diameter of eyes 56-60 μ; antennae length, 242-260 μ; lengths (breadths) of joints, 20-24(25), 40(24), 48-50(19), 47-48(18), 36(17), 44-46(17), 8(8), 12(6) μ. Joints 3 and 4 little narrowed apically, 5 rather broadly truncate at apex, with dark ringlet at base, 6 not constricted at base. Antennae shorter and less slender than in *Taeniothrips traegardhi* Tryb. Pronotum length 140 μ; disc rather densely set (with at

least 30 pairs) of small setae which are inconspicuous owing to their pale colour; *postero-angular bristles conspicuous, but short,* measuring 29-35 (exteriors) and 21-25 μ (interiors); hind margin within postero-angulars with three (seldom four) pairs of small setae. Pterothorax (of holotype) 268-277 μ broad; two pairs of bristles at base of metascutum, the interior of which being longer (34-40 μ) than the exterior. Legs simple, hind tibiae at interior margin with 5-7 hyaline bristles, apart from the terminal spines. Wings (length 710 μ) pale, bristles somewhat shaded only towards tip of wing, rest of them nearly pale; these bristles moderately long, costal vein with 27-31, upper vein with 4+3 basal and *two distal,* lower vein with 12-15 bristles. Abdominal tergite II laterally with three bristles, tergite VIII with fine, complete comb, porus situated nearly between tergite bristles 1 and 2, being, therefore, farther apart from hind margin than from the bristles; bristles on tergite IX fine, moderately long, b.1, 2, 76-80, b.3, 68-72 μ; b.1 of segment X, 66-80, b.2, 66-68 μ. These bristles are slightly shaded. Sternites without accessory bristles. Ovipositor length 242-260 μ. — Total body length (distended) : 1.38-1.5 mm. — Male unknown.

Habitat : Egypt. Meadi, 20.ii.1939, in flowers of *Zilla spinosa.* This little *Taeniothrips* differs from *T. traegardhi* Tryb. by the minute interocellar bristles and the dark antennal joint 6, shorter prothoracic bristles, etc.; it comes closest to *Taeniothrips dilutus* Hood of East Africa, differing from it by its larger size, slenderer intermediate antennal joints, joint 3 and 4 being 2.6 times as long as broad (instead of 2.4 times, as in *dilutus*); the postero-angular bristles of the prothorax are "uncommonly short and noticeable only under high magnification" in *dilutus* (1), whilst they measure 29-36 μ in *zillarum.*

Isoneurothrips australis Bagnall.

(*Ann. Mag. Nat. Hist.,* XV, p. 592; 1915)

This widely distributed insect, a native of Australia, has found its way to Egypt. I discovered it the first time on March 12, 1940, at Montazah, in flowers of *Reseda odorata* and *Linum usitatissimum.* I also possess specimens from *Cyprus* (Limassol, April, 1940) and *Palestine* (Nezli, 12.ii.1938, from flowers of *Prunus amygdalus;* Rehoboth, 20.iii.1938, from flowers of *Tropaeolum majus).*

Distribution : Australia, Japan, Eastern Mediterranean. South Africa, Brazil

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(1) cf. Hood, *Entomologist,* LVIII, 1925, p. 8 (Sep.).

Podothrips aegyptiacus Pr.

Egg : On October 31, 1931, I discovered the eggs of this Haplothripine species, on *Phragmites communis*. They are laid lengthwise singly or in pairs at the inside of the leaf sheaths, not on the stem, just above the nodes.

These eggs are elongate, not much shining, appearing pale grey on their yellowish substratum, sometimes with somewhat reddish hue. They are 490-510 μ long and 148-155 μ broad.

Haplothrips hukkineni spec. nov.

(Figs. 10 and 12)

(cf. Oettingen, Ent. Beihefte, Dahlem, 9, 1942, p. 137)

Synonym.: *Haplothrips juncorum* Priesner, *Wiener Ent. Zeitg.*, 39, 1922, p. 105; idem, *Ann. Mus. Nat Hung.*, XXV, 1928, p. 67; idem, *Bull. Soc. Roy. Ent. Egypte* 1936, pp. 36, 70; Fabian, *Fol. Ent. Hung.*, IV, 1938, p. 20, tab. II, fig. 15 (p. 27); Knechtel, *Bull. Sect. Sci. Acad. Rum.*, XII, 3, 1929, p. 3 (Sep.).

(Nec *Haplothrips juncorum* Bagnall, *Ent. Mo. Mag.*, XXIV, 1913, p. 227; idem, *Ann. Mag. Nat. Hist.*, 1921, p. 368; idem, *Ent. Mo. Mag.*, 1924, p. 116; Maltbaek, *Ent. Meddel.*, 16, 1928, p. 179 (larvae); Bagnall and John, *Ann. Soc. Ent. France*, CIV, 1935, p. 325; Maltbaek, *Danmarks Fauna*, 1932, p. 127; Oettingen, Ent. Beihefte, Dahlem, 9, 1942, p. 139).

Under the above name I have recorded for many years a new *Haplothrips* species that was known to me since 1917, and which I had considered to be *H. juncorum* Bagnall. In 1937, I received a series of specimens of a *Haplothrips* sent by Dr. E. Titschack (Hamburg), from Cuxhaven (June 6, 1933), collected by H. Gebien on *Juncus* spec., and which I thought to represent a new species. On examining type material in R. S. Bagnall's collection, in 1938, I saw that these specimens from North Western Germany were identical with Bagnall's *H. juncorum*, while my own *juncorum* appeared to be an undescribed species.

Haplothrips hukkineni differs from *H. juncorum* Bagnall at the first glance (well mounted specimens) in the form of the head which is less strongly converging anteriorly; in *juncorum*, the margins of the relatively smaller eyes converge evenly, while in the new species, these margins are parallel at least for a short space; the antennae are slenderer in *juncorum*, particularly joint 3 being slenderer and longer (in *juncorum*, e.g,. 56-60(28-32), as against 46-48(28) μ in *hukkineni; juncorum* is somewhat stouter, its tube somewhat longer and narrower (in *hukkineni* 112-120 μ long). The pseudovirga (tip of aedeagus) of the male is quite different in both : in *hukkineni* (fig. 10), this organ is narrowed towards tip, where it is almost abruptly widened, nearly auricular, almost truncate at tip (cf. Fábián, *Fol. Ent. Hung.*, IV, 1938, pl. II, fig. 15), whilst it is simply rounded in *juncorum* (fig. 11). The antennae are generally darker in *juncorum*, but there also exists a form with darker antennae in *hukkineni*, viz., the European

form, being known to me from Hungary (leg. Karny, Pillich, Fábián), Yugoslavia and Albania (leg. Karny, Priesner). This European form may be called f. *phragmitis* nov., since I have found it hitherto exclusively on *Phragmites* (and some similar tall Gramineae), whilst the smaller, typical *hukkineni* was found on various Gramineae and Cyperaceae,

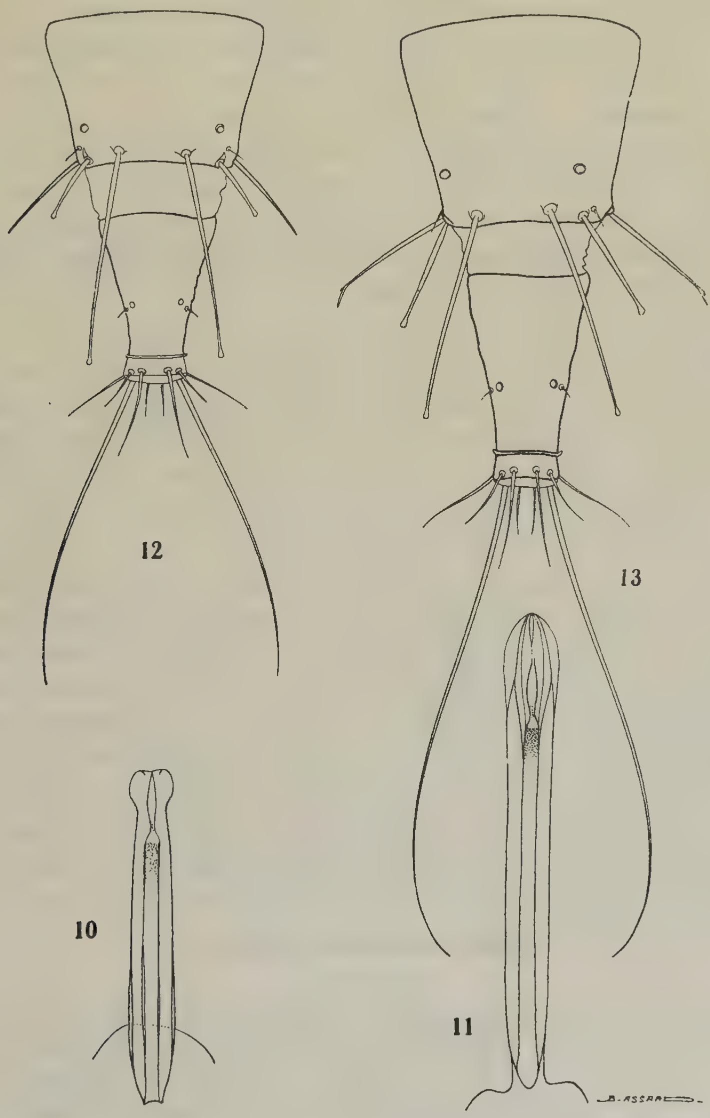

Fig. 10 : *Haplothrips hukkineni* spec. nov., pseudovirga of male. — Fig. 11 : *Haplothrips juncorum* Bagnall, pseudovirga of male. — Fig. 12 : *Haplothrips hukkineni* spec. nov., end of abdomen of larva, 2nd stage. — Fig. 13 : *Haplothrips juncorum* Bagnall, end of abdomen of larva, 2nd stage.

in Albania, Palestine and Egypt. The typical form differs from *phragmitis*, apart from its somewhat weaker build, by the colour of the antennae, for joint 6 is pale at base, rest more or less shaded, while in *phragmitis* it is strongly shaded and only slightly paler than joints 7 and 8; also the preceeding joints are darker in *phragmitis* than in *hukkineni*. Both forms are identical as to the form of their pseudovirgae.

Haplothrips juncorum Bagn. occurs in the coastal regions of England, Germany, France, Italy (new record : Basilicata, Terranova di Pollino; C. Koch), on *Juncus*. *Haplothrips hukkineni* lives on *Gramineae* and *Cyperaceae* (*Phragmites*, *Typha*, *Oryza*, and *Cyperus*).

The larvae of these species are quite different from each other. Those of *juncorum* (2nd stage, ex coll. Bagnall, England, Yarnton, vi.1913, on *Juncus*) are of a deep orange to light crimson colour; antennae (length 268-286 μ) wholly dark, joint 3 : 60-65(24) μ; b.6 of pronotum about 65 μ, knobbed; b.1 of segment IX of abdomen 100 μ, b.2, 60 μ, both knobbed, b.3 67-72 μ, *forked*, b.4 pointed (fig. 13).

In *hukkineni*, the 2nd stage larvae are yellow to deep orange, with an antennal length of 215-235 μ; joint 3 shorter, 46-48(20-22) μ; b.6 of pronotum 44-48 μ; bristles on segment IX, b.1, 100 μ, knobbed but slightly, b.2, 35 μ, knobbed, *b.3 blunt or rounded at tip, not forked*, much shorter than in *juncorum*, 40 μ, b.4 pointed (fig. 12).

Geographical distribution of *H. hukkineni* : Egypt (Helouan, Wadi Geraui, May 1934, leg. Rabinovitch; both sexes and larvae, Damiette, 25.iii.1937, on *Cyperus* sp.; Serw, Lake Menzala, 25.iii.1937, from *Typha* and *Cyperus*; ibidem, 30.x.1948, from *Oryza sativa* and *Phragmites communis*, leg. H. Priesner. — Palestine (Tel Mond and Birket Ramadhan, 16.viii,1935, leg. Rabinovitch). — Albania (Rushkuli, ix.1919, on grasses on sea shore, leg. Priesner; ibidem, on *Phragmites*-like grasses, leg. H. H. Karny). — Yougoslavia (Obbrovazo, 28.vii.1911, on *Phragmites*, leg. Karny). — Hungary (Derecske, 13.ix.1915), on *Phragmites*, leg. Karny; Simontornya, 18.v.1924, on a swampy meadow, leg. Pillich; Balatonfenyes Nadas, vii.1937, leg. Fábián)

Bolothrips arenarius spec. nov.

(Fig. 14 A)

The only species of *Bolothrips* hitherto found in Egypt, is extremely similar to *B. tuberculatus* Pr., to which *B. brachyurus* Bagnall is a synonym, known from the coast of the Adriatic and from Southern France. Of the latter, only the oedymerous form of the male is known. The Egyptian form is represented by a series of specimens in both sexes, the oedymerous male of which has the head noticeably more elongate, 263(183) μ, as against

277(225) μ in *tuberculatus*, when measured exclusive of cephalic production, i.e., 1.4 to 1.6 times as long as broad in *arenarius*, whilst it is 1.2 to 1.3 times as long as broad in *tuberculatus*. The fore femora are decidedly thicker

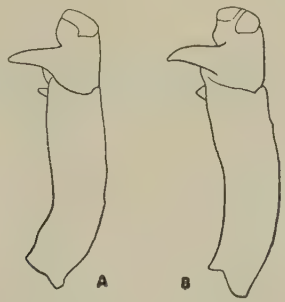

Fig. 14 : (A) *Bolothrips arenarius* spec. nov., for tibia and tarsus of male; (B) *Bolothrips tuberculatus* Pr., fore tibia and tarsus of male.

(380 : 164) in *tuberculatus*, than in *arenarius*. The small tooth at apex of fore tibiae within, is pointed, or at least slender (fig. 14 A) in *arenarius*, whilst it is broadly triangular (fig. 14 B) in *tuberculatus*. In gynaecoid specimens of *arenarius*, the fore legs are slender, the tibial tooth may be very small or even vestigial, the tarsal tooth being developed in all specimens.

The females, too, differ in the shape of the head which is narrower in *arenarius* (268-277 : 197-218), than in *tuberculatus* (260-270 : 225). The antennae are shorter, on an average. All specimens are apterous.

B. arenarius as well as *tuberculatus* differ from *B. icarus* (cf. Priesner, Thys. Eur., p. 693) by their broader and shorter tube, longer bristles of segment IX of abdomen, in comparison with the tube, and darker coloration of legs. A further difference I was able to find in the shape of the eyes which are very slightly produced on the under side of the head, in *tuberculatus* and *arenarius*, whilst this is not so in *icarus*.

Habitat : Egypt (Birqash, 17.i.1935 ; Ismailia, 23.iv.1935 ; Sinai, 22.v.1935, all collected by Rabinovitch; Wadi Umm Assaad, 9.iv.1934, on *Retama raetam*, leg. Priesner; 20 km. north of Quattara, 20.iv.1938, leg. Moh. Hussein). — Syria (Beirout, 21.iv.1935, leg. W. Wittmer).

This species, no doubt feeding on fungus spores on Gramineae (as its congeners), may be collected from turf material.

Studies on the Genus *Scolothrips*

[Thysanoptera]

(with 7 Text-Figures)

by Prof. Dr. H. PRIESNER

From the beginning of this century *Scolothrips* Hinds has been known as an enemy of the *Acarina* family *Tetranychidae*, commonly called "Red Spider."

The first species described — under the generic name *Thrips* — was *Scolothrips sexmaculatus* Pergande (1894, *Trans. St. Louis Acad.*, p. 542; cf. Duffy, 1888-1889, *Trans. St. Louis Acad.*, 5, p. 539 (description, as foot-note, by Pergande)). In 1896, Alice M. Beach described a *Thrips pallida* (*Proc. Iowa Acad. Sci.*, III, pp. 226-227) that obviously belonged to the same genus, and was considered a synonym of *sexmaculatus* by W. E. Hinds when he erected the genus *Scolothrips* on Pergande's *Thrips sexmaculata* (1902, *Contr. Mon. Thys. North Amer.*, p. 157). In 1912, Fr. Schille created the genus *Chaetothrips* on a species (*uzeli* Sch.) he discovered in Poland. This genus was correctly put as a synonym under *Scolothrips* by R.S. Bagnall (1914, *Ann. Mag. Nat. Hist.* (8), XIII, p. 297). In 1926 (Thys. Eur., p. 239) I revised the European and North African species, and described *Scolothrips longicornis* as a new species from Central Europe. Several records and notes, particularly American, and of an economic nature, have been published since, as may be seen from the biological notes below. Two new species from the Canary Islands were described by the author in 1933 (*Stettiner Entom. Zeitg.*, 94), and the Egyptian species were briefly dealt with, and *Sc. longicornis* recorded as an addition to the Egyptian fauna, in 1929 (*Bull. Soc. R. Ent. d'Egypte*, p. 218). In 1937, Yakhontov described *Scolothrips acariphagus* (from Central Asia), a form that was previously erroneously called *Sc. sexmaculatus*. In 1938 I saw an original specimen of *Scolothrips uzeli* (Schille) in Bagnall's collection, and was struck by its similarity to *Sc. longicornis;* it was clear then that *Sc. uzeli* Pries. (1921) was something quite different. And furthermore, when Rhageb Abd El-Malek brought me a third

Egyptian species, from the South of the country, I decided to study this genus more thoroughly on a comparative base. More material was collected, and some odd specimens from India (ex coll. T.V. Ramakrishna Ayyar) and Taiwan (Formosa) (ex coll. R. Takahashi), further some material from South Africa (ex coll. E.K. Hartwig), and a good series from California (ex coll. St. F. Bailey) proved to be very interesting and helpful.

I wish particularly to acknowledge my indebtedness to Prof. Stanley F. Bailey (Davis, Cal.) who supplied me with American material for this study.

A close examination of all the materail at hand revealed that :

(1) In Egypt, at least three species occur, viz., the most widely distributed species *Sc. longicornis*, furthermore *Sc. latipennis* sp.n. (= *uzeli* Pries. nec Schille) and *Sc. rhagebianus* sp.n. ;

(2) *Sc. uzeli* Pr. is not identical with *uzeli* (Schille), but a new species, the latter being very closely allied to *longicornis ;*

(3) *Sc. sexmaculatus* (Perg.) has not been found outside the U.S.A., and has been confused with *Sc. pallidus* (Beach) ;

(4) In North America, there exist at least four different species, namely : *Sc. sexmaculatus* (Perg.), *Sc. pallidus* (Beach), *Sc. longicornis* Pr. and *Sc. hoodi* sp.n.

(5) The specimens from India, Formosa and South Africa are all different from any of the old species, and different from one another, i.e. all hitherto unknown.

(6) Many records under the name of *Sc. sexmaculatus* (Perg.) will have to be revised, particularly the specimens mentioned from Asia, the Pacific Islands, Australia and South America.

SCOLOTHRIPS

1902. *Scolothrips* Hinds, Contr. Mon. Thys. North Amer., p. 157.
1910. *Chaetothrips* Schille, *Akad. Wiss. Krakau,* XIV, p. 5 (Sep.).
1912. *Chaetothrips* Schille, *Ent. Zeitschr. Frankfurt,* p. 21 (Sep.).
1914. *Scolothrips* Bagnall, *Ann. Mag. Nat. Hist.,* XIII, p. 297.
1921. *Scolothrips* Karny, *Treubia,* I, 4, p. 239.
1923. *Scolothrips* Knechtel, Thys. din Roman., p. 160.
1923. *Scolothrips* Watson, Synopsis, p. 11, 36.
1925. *Scolothrips* Priesner, Kat. europ. Thys., *Konowia,* IV, p. 146.
1926. *Scolothrips* Priesner, Thys. Eur., p. 239.
1927. *Scolothrips* Priesner, in Brohmer-Ulmer, Tierw. Mitteleur., IV, p. 6.
1933. *Scolothrips* Priesner, *Konowia,* XII, p. 302 (correction to key).
1933. *Scolothrips* Moulton, *Revista de Entom.,* 3, p. 108 (1).
1934. *Scolothrips* Kelly and Mayne, Australian Thrips, p. 29 (2).

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(1) Moulton records a *Scolothrips* species, characterized by the lack of wing spots; though it is not fully described it is supposed to be an unknown species from Brazil.

(2) A species is briefly mentioned under the name of *Sc. sexmaculatus*, but not fully described.

Emended generic description

Sclerotization of body weak. Body and wing bristles unusually abundant and long. Head broader than long. Maxillary palpi three-segmented. Antennae eight-segmented, with forked sense-cones and well developed setae. Prothorax on fore margin with five (two long and three short) pairs of bristles, with one major bristle at sides, and four pairs at hind margin; a prebasal pair of small bristles present or wanting. Female always macropterous, male macropterous or hemimacropterous. Wing veins more or less conspicuous, practically all along set with long bristles, in most species with three dark dots or cross-bands, one of them on scale. Bristles of apex of abdomen moderately long. Sternites with three pairs of postero-marginal bristles, without accessory bristles. Larvae characterized by their exceptionally long, curved body bristles; cephalic bristles longer than head. Larvae and adults predaceous on *Tetranychidae*.

Typus generis : *Thrips sexmaculata* Pergande.

The species of this genus may be distinguished by structural characters, but in all cases, if fully mature specimens are at hand, much better by their coloration, the latter being characteristical for nearly every species.

The measurements of the antennae play a great part, and the lengths of the bristles of the prothorax and the fore wings. The presence or absence of a pair of accessory bristles on the disk of the pronotum near the base is important (Fig. 1, m); these setae are fine and directed inward, in exceptional cases they are doubled (Fig. 1, m_1); they are wanting or extremely minute in *longicornis*, *uzeli*, *latipennis*, *hartwigi* and *takahashii*, but perhaps also in other species that I have not or no longer at hand; they are, however, well developed in *sexmaculatus*, *pallidus*, *rhagebianus*, *hoodi*, *indicus*. Bristles (m) are always present or wanting in both sexes. Another important character is the width of the fore wings.

More evident and of equal importance is the colour of the body, its appendages and bristles. The general body colour is in some species lemon yellow to pale orange, as in *longicornis*, *hartwigi*, *pallidus* and *hoodi*, while it is whitish yellow in *sexmaculatus* and *latipennis*. Very important for the separation of the species are the greyish shadings of the body and legs, wholly wanting in *longicornis* and *pallidus*, and on head, prothorax and abdomen wanting in *hartwigi*.

The males agree with the females, as to their colour, though they are paler, as a whole. The arrangement of the bristles on tergite IX, and the shape of the wings can also be used for the separation of the males of the species.

Scolothrips sexmaculatus (Pergande)

1894. *Thrips sexmaculata* Pergande, *Trans. St. Louis Acad.*, p. 542.
Nec *Scolothrips sexmaculatus* auctt.

Pale whitish yellow, with more or less pronounced, usually slight gr: shadings on the body, namely : Two sometimes fused spots on either side of the posterior portion of the pronotum, sides of mesonotum, nearly the whole metanotum; on the pterothorax, the pleurae are darkest; usually all abdominal segments are slightly shaded with pale grey, the extreme sides remaining pale, separated side spots are never present, in rare cases the central darkenings may be replaced by lateral dots; terminal abdominal segments mostly wholly pale. Legs with fore coxae, exterior margins (or more) of fore femora, sometimes also middle femora, and subbasal rings on the tibiae pale grey. Antennae with joint 1 pale, 2 sometimes pale, but usually at least partly grey, as is joint 3 or its apical portion, following joints dark, 4 sometimes pale at base. Wing scale dark in basal half (or more), and with two dark spots that are never long, often not longer than broad, the first band (spot), as in the following species, *not reaching fore margin*, band 2 often not attaining hind margin. Numerous bristles of wings dark, at least those on the cross-bands, in fully mature specimens also the bristles of the prothorax shaded.

This species is a little less elongate than *pallidus* or *longicornis*. Head, width 128-132, length of eye ab. 68 μ. Interocellar bristles, length 92-96 μ; major bristles on prothorax, length 100-112 μ. Accessory bristle (m) on disk of pronotum well developed, 28-32 μ. Prothorax, width 185, pterothorax, width 242-252 μ. Antennae similar as in *pallidus*, very slightly longer, but much shorter than in *longicornis*, 215 μ. Example of measurements of joints : 15-17(26-27), 34-35(24-25), 36(21), 31-32(18), 29-31(17), 42-45(16), 11-13(7-8), 14(5) μ. Wings length 700-760, width across first spot (not scale spot) 57-62 μ; length of costal bristles at first spot (or cross-band) 120-130, of bristles at second spot 140-150 μ. Costa with 19-22, upper vein with 4-5 + 4-6, lower vein with 6-7 bristles. Bristles at hind margin of abdominal segment IX 95-100, dorsals 52-60 μ. Length of hind tibiae 152-176 μ.

Male : Colour as in the female, but paler on an average; there exist nearly wholly pale specimens, but in these, femora and tibiae are shaded with pale grey. Antennae with joint 2-8 grey.

Width of head 120 μ, eyes (laterally) 44 μ. Major bristles on pronotum, length 112-128, seta (m) 36-40 μ. Antennae, lengths (breadths) of joints : 8-10(23), 28(22), 29-31(17), 27(17), 22-25(15), 32-36(14), 11(8), 11(6) μ. Wings fully developed, length 520-588, width across first band 48-50 μ. Bristles at hind margin of tergite IX situated in one transversal row, b.1 : 48-52, b.2 : 44-48, b.3 : 36-40, b.4 : 80 μ. Width of pterothorax 2-8 μ.

Costa with 16, upper vein with 4+4, lower vein with 5 bristles. Costal bristles at first cross-band measuring about 96-104, at second cross-band 92-112 μ. The dumb-bell-shaped glandular areas of the sternites varying in width, perhaps usually 136-150, on VIII, 112 μ.

The above description is based upon specimens presented to me by Prof. St. F. Bailey who received them from peach leaves (Empire, Cal., 14.ix.1949, leg. F.M. Summers).

It is the only form from the U.S.A. that agrees with the description given by Pergande; I am quoting part of the description :

« Colour pale yellow, the head almost white, the thorax darkest, the prothorax often more or less distinctly marked with four small dusky spots and two oblique stripes; frequently the anterior margin of the pterothorax, its disk, and a spot near the base of all the wings, are also dusky, and also more or less of the anterior margin of the abdominal segments. The legs are usually pale yellow with only the tips of the tarsi blackish, though now and then a specimen may be met with the apex of the femora dusky, and with a pale dusky spot in front and behind, at base of anterior and median tibiae." About the wings Pergande says : ("... the anterior pair being ornamented with three more or less distinct or well-defined dusky spots, of which the terminal one forms usually a band...".

There is, of course, to be considered the possibility that Pergande had a mixture of two species when making his description. On the other hand, it seems clear to me that Hinds' material has to be referred to the following species, thus *Sc. sexmaculatus* Hinds as well as *Sc. sexmaculatus* Bailey having to be synonymized with *Sc. pallidus* (Beach), though definite certainty on this synonymy can only be obtained through a close study of the types of Pergande's and Beach's species, which I was unable to examine.

Scolothrips pallidus (Beach)

(Fig. 1)

1896. *Thrips pallida* Beach, *Proc. Iowa Acad. Sci.*, III, p. 226.
1902. *Scolothrips sexmaculatus* Hinds, Mon. Thys. North Amer., p. 157, pl. IV, figs. 42-45.
1928. *Scolothrips sexmaculatus* Hood and Herrick, Mem. 101, Cornell Univ., p. 68.
1939. *Scolothrips sexmaculatus* Bailey, *Journ. Econ. Ent.*, 32, 1, pp 43-47, fig. 1 [3].

To this species I have to refer a series of specimens, both sexes, I received through Prof. J. D. Hood and Prof. St. F. Bailey from the United States. This species may be recognized by the following description :

Body pale yellow, without any shadings except a usually indistinct

[3] Most important paper on biology and economic status of the species.

lateral grey spot on either side of meso- and metathorax; abdomen always without any infumations. Legs pale. Antennae pale grey, joint 1 — or also 2 — almost hyaline. Fore wings, as normal in this genus, with three spots: the scale spot, the first spot (or band) on the blade proper, and the second band (or spot); in *pallidus*, the scale spot is as usual, leaving the smaller apical portion of the scale hyaline; the first cross-band does not reach the fore margin of the wing (cf. Bailey, l.c., fig. 1 A) like in *sexmaculatus* and *rhagebianus;* the second cross-band is little or not longer than broad. Of the wing bristles at least those on the dark cross-bands are darkened.

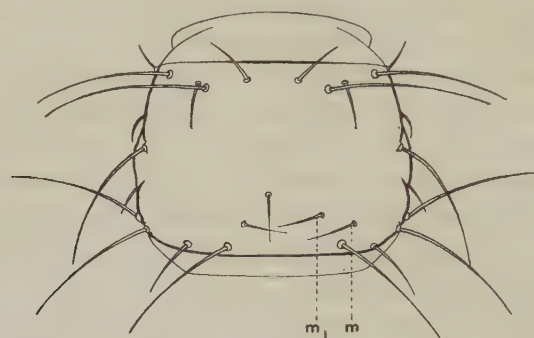

Fig. 1: *Scolothrips pallidus* (Beach), prothorax showing chaetotaxy (m = accessory bristle; m_1 = additional pair occurring abnormally).

The species is, moreover, characterized by the comparatively short antennae, with well rounded sides of joint 5, the long bristles on the prothorax and wings, and the presence of the accessory pair of small setae (m) on the disk of the pronotum, in front of, but somewhat more approximated than, the postero-marginal bristle pair 1; seta (m) may exceptionally be doubled on one side or both sides, and measures 30-40 μ (cf. Bailey, l.c., fig. 1 B).

Measurements of female in μ: Interocellar bristles, length 85. Antennae, total length 194-202; lengths (breadths) of joints: 14, 34(27), 34-36(20), 28(19), 25-27(17), 38-39(17), 11(7-8), 11-13(5). Bristles on fore margin of pronotum, b.1: 40, b.2: 108-112, b.3: 32-36, b.4: 100-105; lateral bristle, 96-105; bristles on hind margin, b.1, 3, 4, 100-105; b.2: 40-50. Wings, length 675-745, width at first cross-band 48-50. Lengths of wing bristles, at first cross-band: 112-127, at second cross-band: 132-145 μ. Bristles at hind margin of segment IX of abdomen, 88-100, dorsal pair 52-60. Hind tibiae, length 160. (Costa with 20-22, upper vein with 2-3+6, lower vein with 6-7 long bristles).

Male: The male is quite different from that of *longicornis*, in having, apart from the shorter antennae, fully developed wings (length 502-520,

width 39-42), and bristles on hind margin of segment IX (b.1 : 44-48, b.2 : 36-44, b.3 : 28-32, b.4 (lateral) 64-72), *all arranged in one transverse row.*

Measurements of male, in μ : Interocellar bristle about 68. Antennae, total length 165-169; lengths (breadths) of joints : 10-12(20-21), 28(21), 31(15), 25(16), 22(14), 29-31(14), 8-10(7), 11(4). Major bristles on pronotum, length 72-80; lateral bristle, 68; seta (m) at least 22. Width of head 104-106; length (lateral) of eye 45. Prothorax, length 96, width 132. Pterothorax, with 176. Wings (see above). — (Costa with 16-17, upper vein with 8-9, lower vein with 5 bristles). Length of costal bristles at first cross-band 80-92, at second cross-band 92-104. Grandular areas (developed on sternites III-VIII), width on sternite VII : 112, on sternite VIII : 95.

From the hitherto known species having a seta (m) on disc of pronotum *pallidus* differs : from *rhagebianus* by the infumated bristles on the cross-bands of the wings, the shorter cross-band 2, and the lack of dark spots on prothorax, or dark bands on abdomen; from *hoodi* by the larger size (hind tibiae!), smaller cross-bands, the first of which does not attain fore margin of wing, and the uniformly pale prothorax, abdomen and legs, and also the longer bristles, particularly longer wing and prothoracic bristles and longer seta (m); from *indicus* by the pale pronotum and abdomen, and the inconspicuous wing veins; from *sexmaculatus* (Perg.) it is distinguished by the uniformly pale colour of the body, the somewhat narrower wings, and the somewhat shorter antennae.

Records : Females, Davis, California, 20.v.1946, on rose; 18.vii.1934, hops in greenhouse; 1.viii.1936, on walnut; 18.viii.1932, on corn; Shafter, Cal., 22.v.1941, on cotton; male, Sacramento, Cal., 31.viii.1935, on *Buxus* infested with red spider; female, Goshen, N.Y., 1.viii.1912, horse chestnut, predator on mites, leg. J.C. Faure; male and females, Chester, N.Y., 15.viii.1912, elm leaves, predator on mites, leg. J.C. Faure; all ex coll. St. F. Bailey; male, Phoenix, Arizona, 30.x.1914, leg. H.M. Russell, feeding on "red spider" (ex coll. Hood, No. 229); male and female, Miami, Fla., 1.viii.1919, feeding on "red spider," leg. Mosnette (ex coll. J.R. Watson).

Scolothrips hoodi spec. nov.

Scolothrips sexmaculatus Hood, 1917, Ins. Insc. Menstr., V, p. 58. 6 34

Female : Pale yellow to pale orange, with rather uniform slight shadings on head, prothorax, pterothorax and all abdominal segments. Antennae uniformly pale grey, only joint one whitish. Legs shaded with pale grey, tibiae more strongly shaded than femora, tarsi pale or nearly so. Bristles on wings greyish, not only those on the dark cross-bands, but also those inserted between. Scale shaded with grey except for its apex. Cross-

bands (dark) on wings comparatively *long*, longer than broad, particularly band 2, the latter, however, not very sharply defined, gradually fading into the hyaline parts.

Head rather broad, 130 μ, cheeks short, somewhat widened posteriorly (in specimens with segments contracted). Lateral length of eye 52 μ. Interocellar bristles comparatively short, 50-64 μ. Total length of antennae (obtained by addition of joints) 190-197 μ. Lengths (breadths) of antennal joints: 14(27) 31(24), 34-35(19-20), 29-31(19-21), 25-27(17-18), 36-37(17), 10-11(8), 11(5) μ. Longest (dorsal) bristle on joint 4 : 27-28 μ. Prothorax, length 105, width 180 μ. Bristles 1 and 3 on fore margin of pronotum very small, b.2 : 68-80, b.4 : 64-68 μ; lateral prothoracic bristle 68, postero-marginals, b.1 : 64-68, b.2 : 28 ?, b.3 : 72-76, b.4 : 73 μ. Seta (m) on disc 18-20 μ. Pterothorax, width 225-250 μ. Interior basal bristles on metascutum short, 28 μ, not reaching (by far) hind margin. Wings, length 657, width at first cross-bar 50-52 μ. Costa with 20-21, upper vein with 8-9, lower vein with 5-6 bristles; costal bristles, length at first cross-band 80-85, at second cross-band 104-116. Bristles on segment IX of abdomen, b.1, 2 : 88, b.3 : 80; dorsal pair 40 μ. *Length of hind tibiae : 136-140 μ.*

Male unknown.

Habitat: "Plummer's Island" near Washington, D.C., 18.v.1913, in beatings from *Juniperus virginiana* L. (coll. J.D. Hood).

Owing to the presence of seta (m) on the disc of the pronotum, this species belongs in the group of *sexmaculatus*, from which it is distinguished by its smaller size, shorter legs and antennae, much shorter bristles on thorax and wings, the complete first cross-band of the fore wings (extending to margins), longer second band, shorter abdominal bristles; from *pallidus*, besides, by the presence of shadings on the whole body and the legs, and finally by the coloration of the antennae.

Scolothrips rhagebianus spec. nov.

(Figs. 2 and 3)

Female: Pale yellow to lemon yellow, extreme tip of abdomen sometimes orange; body with grey markings; pronotum with two, sometimes united, small spots on either side of the disc, two lateral spots on mesoscutum; metascutum nearly wholly darkened, also sides of pterothorax with grey spots. Abdominal tergites — at least III to VI — grey, paler at sides, segments I to VII usually with a detached small grey spot at the sides. Joints 1 and 2 of the antennae hyaline, 3 and 4 shaded with pale grey, except at base, the rest of the antennae greyish. All femora with an irregular grey spot at the exterior margin about middle, fore and middle tibiae with an incomplete grey ring beyond base. Fore wings with the usually dark

basal half of the scale, and two dark cross-bands, one about the fork of the longitudinal veins, normally *not attaining fore margin of wing*, the distal one longer. Bristles of body and wings hyaline, only bristle 1 (or base of 2) of lower vein (at the fork) somewhat shaded.

Eyes convex with coarse facets. Interocellar bristles, length 84-88 μ. Ocellar hump conspicuous. Head, width 122-132 μ. Antennae, total length 192 (obtained by addition of joints); lengths (breadths) of joints : 14(25), 31(24), 34(20), 28(20), 25(16), 36-38(16), 10(7), 14(5) μ. Longest bristle on joint 4 (dorsal) 40 μ. Pronotum, length 128, width 172 μ. Major prothoracic bristles, length 96-104 μ. Pterothorax as long as broad, 242 μ. Wings, length 718-727, narrow, width about basal cross-band 58. μ. *Veins very conspicuous*, costa with 18-19, upper vein with 8-9, lower vein with 6-7

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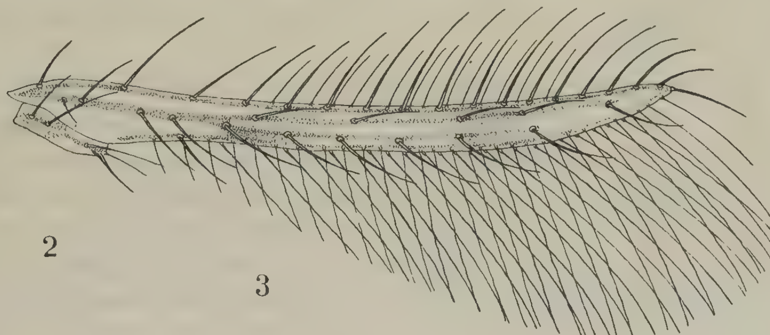

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Fig. 2 : *Scolothrips rhagebianus* sp. n., antenna of female. — Fig. 3 : *Scolothrips rhagebianus*, sp. n., fore wing of female.

bristles, the first of which situated in the fork, shaded. The costal bristles at the first cross-band measure 108-112, those at the second cross-band 124-132 μ. Bristles at hind margin of segment IX about 80 μ, the dorsal pair 48-52 μ. Hind tibiae, length 168-176 μ.

Male unknown.

Habitat : Egypt, Beni Suef, on *Prunus persica*, infested with *Tetranychidae;* Malaka, near El-Derr, 12.iv.1931, on leaf of *Cucurbita* with *Tetranychidae;* Wadi Halfa, x.1935, on *Hibiscus esculentus*. All collected by Rhageb Abd El-Malek.

I have dedicated this species to the late Rhageb Eff. Abd El-Malek, of the Entomological Section, Ministry of Agriculture.

This species, no doubt close to *sexmaculatus*, is chiefly characterized by its pale bristles, the striking coloration of body and legs, the short antennae, the narrow wings, the length of the bristles, and the presence of the

pre-basal prothoracic bristle pair that is not present in any other Egyptian species.

Scolothrips indicus spec. nov.

1926. *Scolothrips sexmaculatus* Karny, *Mem. Dept. Agr. Ind.*, IX, 6, p. 195.

This species (?) very much resembles *Sc. rhagebianus* in the coloration of the body, but there are quite a number of differences compelling me to consider and describe it as a proper species.

Prothorax (two pairs of dots), pterothorax and abdomen with the grey markings as described for *rhagebianus;* the antennae, however, being wholly pale grey, the legs uniformly pale yellow, and the bristles on the *inconspicuous* wing veins being dark, even on the transparent parts of the wing and the scale.

I only know one couple of this species, the structural characters of which are as follows :

Lengths (breadths) of antennal joints of female (holotype) ; from joint 2 : 31(23), 36(20), 29-31(18), 25(17), 34(16), 8(6), 11-12(3-4) μ. Longest bristle on joint 4 : 32-34 μ. Bristles on pronotum, length about 92, longest (b.2) antero-marginal about 100 μ. These bristles are only very slightly shaded. Seta (m) on disc of pronotum well developed, length at least 32 μ. Pterothorax, length (width) : 208(208). Wings, length 632-640, width at first cross-band 48 μ. Longest costal bristle at first cross-band 120-124, at second cross-band 132-140 μ. Costa with 16-17, upper vein with 8-10, lower vein with 5-6 bristles. Wing veins not or scarcely indicated. Dark spot at base of scale occupying basal half (or somewhat more), the cross-bands *short*, spot-like, first cross-band not attaining fore margin of wing. Bristles on segment IX, length 88-92 μ, i.e. longer than in *rhagebianus*. Hind tibiae, length 152 μ. Ovipositor, length 200 μ.

Male : Agreeing with female in coloration, except that the prothoracic spots are indistinct, and also the markings on the abdomen much less pronounced. Prothoracic bristles slightly shaded, most of those on wing veins distinctly shaded. Measurements of antennae, total length (distended) 168 μ; lengths (breadths) of joints, from joint 2 : 28(35), 29(16), 24(16), 21-22(13), 32-33(13), 8(6), 11-13(4) μ. Longest seta on joint 4 : 25 μ. Head, width 100 μ; diameter of eye 44 μ. Major interior antero-angular (b.2) bristle 80-84, postero-angulars of prothorax 68-72 μ. Pterothorax, width 170 μ. Wings, length 492, width across first cross-band 40-42 μ. Costal bristles at first cross-band 88 μ. Bristles on hind margin of tergite IX. Bristle 1 not in a line with bristles 2 and 3, 42-44 μ, b.2 : 44, b.3 : 32, b. 4 : 56 μ. Glandular areas as usual, much narrowed medianly, widened

laterally, each occupying nearly the whole sternite. Length of hind tibiae : 125 μ.

Habitat : 1 female, 1 male, South India, Coimbatore, 1.ix.1923, in flowers of *Punica granatum*, leg. A.G. Ramaswamiah (ex coll. Karny).

Scolothrips uzeli (Schille)

1910. *Chaetothrips uzeli* Schille, *Akad. Wiss. Krakau*, XIV, Sep. p. 5, figs. 6, 7.
1912. *Chaetothrips uzeli* Schille, *Ent. Zeitschr. Frankfurt*, Sep. p. 21, figs. 6, 7.
1936. *Scolothrips sexmaculatus*, Kéler, Thripsi Polski, p. 100.

Through the kindness of Dr. R.S. Bagnall I received a female specimen of this species (ex coll. Schille); this specimen has to be considered as a cotype. It shows that Schille's illustration (l.c.) of the fore wing, on which I based my previous identification (Thys. Eur., 1926, p. 241) is incorrect, for this species has nothing in common with the Egyptian species (l.c., pp. 241-242) I gave the name *uzeli*. The Egyptian form is in fact a new species (*latipennis* m.), described below. *Sc. uzeli* is, however, very close to *longicornis* Pr.

From the cotype specimen, though it is faded out through the action of the "preserving" alcohol, the following characters may be taken :

Colour most likely uniformly pale yellow (in fresh specimens), darkenings at most on sides of thorax, if any. Antennae pale grey, probably joint 2 slightly shaded, joint 1 clear. *Cross-bands* on fore wing *longer* than in *longicornis*, first band reaching fore margin as in *longicornis*. Scale dark up to apex, leaving hyaline beyond middle only a very narrow margin. Bristles on cross bands slightly shaded, but they are most likely strongly shaded with grey in fresh specimens.

Head, length 68, width across eyes 124-128 μ, eyes slightly bulging, cheeks not narrowed posteriorly. Interocellar bristles 76-80 μ. Antennae, lengths (breadths) of joints : 14(27, 34(27), ? (20), 31(18-19), 31(16), 42(?), 11(7-8), 16-17(5) μ. Pronotum about 108, width (?) 165 ; b.1 of antero-marginal bristles small, 20-24 μ, b.2 : ?, b.3 small, 28, b.4 : 92-96 ; lateral bristle 92 ; postero-marginal bristles, b.1 : 92-96, b.2 : 60, b.3 and 4 : 92. Pterothorax, width (slightly pressed) 232 μ. Wings, length 675-690, width at first cross-band, 52-54 μ. Costa with 18, upper vein with 2-3 basal + 5 distal, lower vein with 7 bristles. Costal bristles at first cross-band 100-116, at second cross-band 124-136 μ. Bristle 2 at scale 85 μ (120 μ in *longicornis)*. Bristles 1 and 2 on segment IX : 76-80, b. 3 : 88 μ ; dorsal pair on IX : 40 μ. Hind tibiae, length 172 μ.

At first sight, this species much resembles *longicornis*, especially in the measurements of the antennae and legs, but a closer examination reveales

differences that have to be taken as being of specific value. The body and wing bristles are decidedly shorter than in any of the numerous examples of *longicornis* at my disposal; the more extensively shaded scale, and the longer cross-bands of the wing are further differences. Unfortunately, the body coloration of this unique specimen of *uzeli* that has been kept in alcohol for so many years cannot be relied upon.

Scolothrips longicornis Priesner

(Figs. 4 and 5)

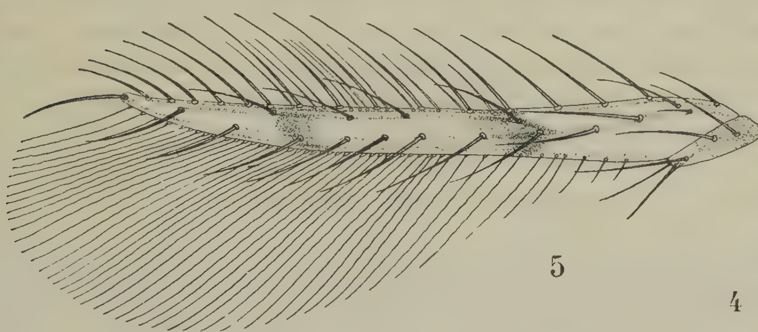
1920. *Scolothrips sexmaculatus* Priesner, Mus Linz, LXXVIII, p. 57.
1923. *Scolothrips sexmaculatus* Knechtel, Thys. Roman., p. 160.
1925. *Scolothrips longicornis* Priesner, Kat. eur. Thys., *Konowia*, IV, p. 146.
1926. *Scolothrips longicornis* Priesner, Thys. Eur., p. 239, Taf. IV, Abb. 51.
1927. *Scolothrips longicornis* Priesner, in Brohmer-Ulmer, Tierwelt Mitteleur., IV, p. 6.
1927. *Scolothrips longicornis* Bagnall, *Ann. Mag. Nat. Hist.* (9), XIX, p. 570.
1927. *Scolothrips longicornis* Priesner, in Stellwaag, Weinbauins., p. 177, Abb. 65.
1928. *Scolothrips longicornis* Priesner, Thys. Eur., p. 718 (male).
1928. *Scolothrips longicornis* Priesner, *Ann. Mus. Nat. Hung.*, XXV, p. 63.
1928. *Scolothrips sexmaculatus* John, *Ann. Soc. Ent, Belg.*, LXVIII, p. 138.
1929. *Scolothrips longicornis* Priesner, *Bull. Soc. Roy. Ent. d'Egypte*, pp. 218-219.
1932. *Scolothrips longicornis* Priesner, *Bull. Soc. Roy. Ent. d'Egypte*, p. 142.
1932. *Scolothrips longicornis* Del Canizo, Tisan. Pen. Ibér., p. 10.
1935. *Scolothrips longicornis* Bagnall and John, *Ann. Soc. Ent. France*, CIV, p. 318.
1937. *Scolothrips longicornis* Hukkinen and Syrjänen, *Ann. Ent. Fenn.*, 3, pp. 9-11, Abb. 10.

The description of this species (l.c., 1926) has to be revised in the light of our present knowledge.

Female: Pale lemon yellow to orange yellow. *Body and legs without darkenings.* Antennal joints 1 and 2 light, not shaded, the following joints slightly infumated, 3, 4 and 5 pale or hyaline at base or to a greater extent. Wings hyaline, with scale grey in basal half or two-thirds, and with two short bands, the first of which usually does not quite reach *hind* margin, band 2 being broader than long, more spot-like than band-like. Bristles on wings wholly or partly dark, those on dark bands as well as those on the hyaline parts. Bristles on prothorax light or slightly shaded. Tip of abdomen sometimes orange within.

Body bristles very long, interocellars measuring 88-93 μ. Antennae, total length 220-235 μ; lengths (breadths) of joints: 14-15, 34-36(25-26), 35-41(17-18), 31-35(17-18), 31-34(15), 43-46(14), 10-13(7-8), 14-16(5-6) μ. Bristles on fore margin of pronotum: b.1: 40, b.2: 100-105, b.3: 32-36, b.4: 96 μ; lateral bristle and bristles on hind margin (b.1, 3): 92-96, b.2: 52 μ. Setula (m) on disc of pronotum wanting or reduced to a scarcely discernible microtrichium. Bristle 1 of metascutum long, not quite reaching hind margin. Wings comparatively narrow, length 148-160 μ, width across first cross-band 96-108 μ. Bristles on wings very long, costal bristles on first

cross-band 120-136, those on second cross-band 152-156 μ. Costa with 17-20, upper vein with 9-11, lower vein with 5-7 bristles. Bristles on segment IX of abdomen 80-95 μ. Hind tibiae, length 160-180 μ.



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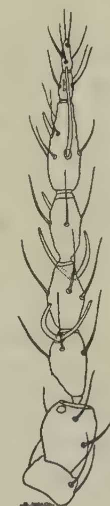

Fig. 4: *Scolothrips longicornis* Pr., antenna of female. — Fig. 5: *Scolothrips longicornis* Pr., fore wing of female.

M a l e : Hemimacropterous. Antennae pale grey, joints 1 and 2 hyaline, Body pale yellow, without shadings. Wings with three dark spots that are, owing to the shortness of the wings, more closely approximated than in the female. Bristles on wings darkened.

Antennae, length of joints : 14, 28, 31-32, 28, 24-28, 37-38, 10, 13-14 μ. Costa of fore wing with 5-7, upper vein with 5-6(2 distal), lower vein with 2 bristles. Wings sharply pointed, length 264-272 μ. Scale with 3-4 long raised bristles and the usual terminal seta. Bristles on costa (at first cross-band), length 96-108 μ. Bristles on tergite IX not on one level, b.1 and 3 pre-apical, b.2 and 4 at hind margin. Sternites III to VIII with very broad, dumb-bell-shaped glandular areas.

The species is widely distributed. Apart from the original specimens from Austria, Hungary, Rumania and Egypt, further material was brought forward by D e l C a n i z o from Spain, and by B a g n a l l and J o h n from France, Andorra and Spain, and by H u k k i n e n from Finland. A male specimen from the Crimea (Nikita, Botanical Gardens, 21.xi.1929, on *Soja hispida*), also belongs ot this species. It is particularly interesting to note that I saw two specimens from Davis, California (leg. St. F. B a i l e y : on corn, 18.viii.1932, and on *Platanus* leaves, 16.viii.1949) fully agreeing with Egyptian examples.

In Egypt, this species was found first by Willcocks (30.vi.1906) in Cairo, on leaves of *Tropaeolum majus*, on *Pisum* (15.iv.1910) and on *Datura* (v.1910); later on by myself at Giza and Dokki on *Ipomoea batatas* (2.xi.1931), on *Ricinus communis* (15.vi.1929, and 19-21.ix.1949), on *Convolvulus arvensis* (16.xi.1929), on *Bauhinia* (22.v.1933), and on *Citrullus vulgaris* (7.vii.1937). The host plant has no significance — in Europe it was found on *Euphorbia*, *Coronilla*, *Stachys*, *Carpinus* —, but the insect is always associated with *Acarina* of the family *Tatranychidae*. On *Citrullus* (in Egypt) it feeds on *Eotetranychus cucurbitacearum* T.S. (det. Taher Sayed). Males were observed in this country in July and November.

Scolothrips takahashii spec. nov.

Female: Pale yellow to orange yellow, with faint grey markings so that the general colour appears to be brownish yellow. Pronotum with two approximated or fused, indistinct, pale grey spots, in posterior portion. Pterothorax at shoulders, mesoscutum at sides and metascutum slightly tinged with grey. All abdominal segments, except IX and X which are pale yellow, shaded with pale grey, tip of segment X with some orange pigment, within. Antennal joint 1 light, 2-8 pale grey, 3-6 very little lighter at base. Legs with tibiae very slightly shaded with grey along margins. Wings hyaline, with scale grey except for its apical third, and with two cross-bands that are somewhat longer than wide. Bristles on prothorax very slightly, those on dark spots or bands of wing strongly, infumated.

Interocellar bristles, length about 88 μ. Antennae, total length 232-237 μ, relatively slender. Measurements of joints, from joint 2: 34-35(27), 36-38(21), 34-35(19-20), 34-35(17), 50-52(15), 14(8), 17(6) μ. Longest seta on joint 4: 34 μ. Pronotum, as usual, with two pairs of long and three pairs of short bristles, b.1 about 56, b.2 and 4 : 108 μ; lateral bristles, length 96, postero-marginal bristles, b.1: 108, b.2: 64-68, b.3, 4: 96-100 μ. Seta (m) of disc of pronotum wanting. Pterothorax, width 250 μ. Wings comparatively broad, length 795, width at first cross-band 68 μ; veins inconspicuous, costa with 21-22, upper vein with 9-10 (4-5 basal) bristles, lower vein with 5-6 bristles. Wing bristles very long, costal ones at first cross-band measuring 144-152, those on second cross-bar 160-180 μ. Bristle 1 on segment IX of abdomen 70, b.2 : 85 μ. Hind tibiae, length 180-185 μ.

Male unknown.

Though I have only one specimen of this form, I do not doubt, after the study of so many species, that this is a 'good' one. In the shape of the wings, and the general colour it much resembles *latipennis* n.sp., but strikingly differs by the long, slender antennae, especially the slender joints 5 to 8, by the darkened bristles on the bands of the wings, and the longer

cross-bands. It cannot be confused with either *uzeli* or *longicornis*, owing to the broad wings and the distinct shadings of the body, and it differs from *hartwigi* not only by the longer antennae, but also by the colour, the body and wing bristles and the much broader wings.

Habitat: 1 female (holotype), Formosa (Taiwan), Taihoku, 15.i.1938, on leaf of *Ricinus*, leg. R. Takahashi.

Scolothrips hartwigi spec. nov.

Female: Fully mature specimens are pale lemon yellow, without darkenings on head, prothorax and abdomen, but *with strong brown shadings* at the sides of the pterothorax, two dots on the metanotum, and with some orange within the pterothorax. Antennal joints 1 and 2 pale yellow, 3 and 4 whitish, with very pale grey shade at sides and at apex, 5 hyaline about basal half or third, shaded at apex, 6-8 grey, 6 somewhat paler at base. Anterior prothoracic bristles scarcely pale grey, but those on hind margin distinctly darkened. Bristles on wings hyaline or slightly shaded, but those on cross-bands distinctly infumated. Legs pale lemon yellow, without infumation. *Scale of wing shaded only at extreme base*, the two cross-bands are longer than broad, everywhere attaining margins.

Head, width across eyes about 75 μ, eyes bulging, length 60-63 μ, cheeks shorter than eyes, slightly narrowed towards base. The long pair of interocellar bristles 105 μ. Antennae, length 192 μ; lengths (breadths) of joints : about 14(25), 31(25), 34(21), 28(20), 28(17), 35-36(15), 10(7.5-8), 11(16) μ. Longest dorsal seta on joint 4 : 32-36 μ. Prothorax, length about 108, width 144, narrowed anteriorly. Longest antero-marginal bristles (b.4) and lateral prothoracic bristles 80 μ, b.3 of antero-marginals longer than b.1, 36-40 μ, the three pairs of long postero-marginal bristles about 80 μ, b.2 weak. Prebasal seta (m) wanting. Pterothorax, width 196 μ. Wings, length 605, width 48 μ. Longest costal bristle at first cross-band 100, at second cross-band 112-120 μ. Bristles 1, 2 on segment IX 52-60 μ, b.3 : 68 μ. Hind tibiae, length 152-156 μ.

This new species comes into the group of *uzeli* and *longicornis*, differing from both by the considerably shorter antennae, and shorter body and wing bristles; from *longicornis*, moreover, by the infuscated pterothorax, and the longer dark bands on fore wing; from *uzeli* by the longer and more strongly bulging eyes, and the slenderer antennal joint 2,a.s.o. I have named this species after its discoverer, Mr. E.K. Hartwig (Pretoria).

Habitat: A few females (holotype and paratypes), Transvaal, Pretoria, 2.iii.1949, on *Combretum zeyheri* Sond., leg. E.K. Hartwig.

Scolothrips latipennis spec. nov.

(Fig. 6 and 7)

1923. *Scolothrips sexmaculatus* v. (?) *uzeli* Priesner, *Ent. Mitteil.*, XII, p. 66, 115.
1926. *Scolothrips uzeli* Priesner, Thys. Eur., p. 241, Taf. IV, fig. 52.
1927. *Scolothrips sexmaculatus* Priesner, in Stellwaag, Weinbauinsekten, p. 176, (p.p.); Abb. 64.
1929. *Scolothrips uzeli* Priesner, *Bull. Soc. Roy. Ent. d'Egypte*, pp. 218-219.
1933. *Scolothrips uzeli* Priesner, *Stettiner Ent. Zeitg.*, 94, p. 195.

Female : Ground colour whitish yellow, with brown-grey markings and shadings. Antennae wholly more or less pale grey, joint 2 darkest. Head and pronotum with grey shadings, pronotum paler with some pale grey, ill-defined spots. Abdominal segments (inclusive of VIII or even IX) evenly shaded with grey, segment X pale yellow or whitish. Femora and tibiae with distinct markings, in some cases only outer margins grey. Fore wings with scale grey at base, and with two dark cross-bands, the first of which is as long as broad or somewhat longer, second cross-band longer than broad, and often obliquely truncate apically, both bands reaching fore and hind margins. All bristles on wings hyaline, only a few of the bristles on the dark bands somewhat infumated only at base.

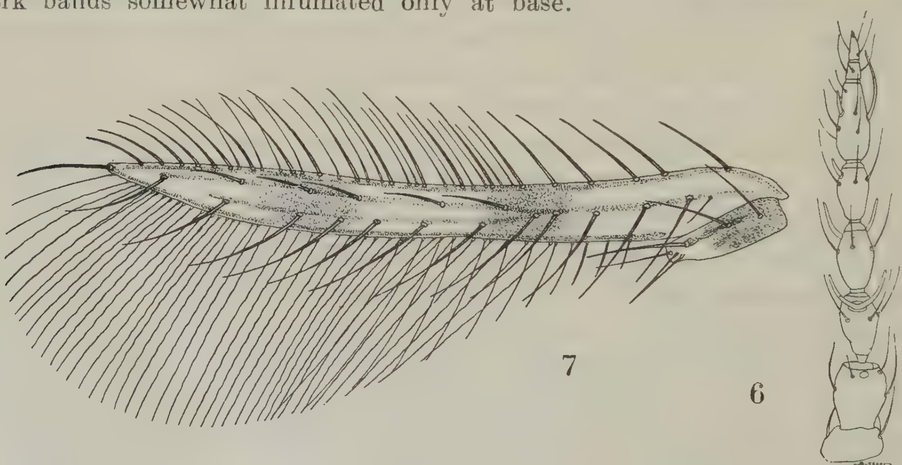

Fig. 6 : *Scolothrips latipennis* sp. nov., antenna of female. — Fig. 7: *Scolothrips latipennis* antenna

Body heavier than in either *uzeli* or *longicornis*, head rather small, wings comparatively *broad*. Head about 132 μ broad, eyes convex, ocellar hump usually strongly bulging. Interocellar bristles about 80 μ. Maxillary palpi, lengths of joints 10, 13, 14 μ. Antennae, length 208-216 μ. Lengths (breadths) of joints (holotype) : 17(27-28), 34(27-28), 35-36(20), 32-34(20), 28(7), 39(17-18), 11(7-8), 14(6) μ. Antennal setae and sense-cones long, longest seta on joint 4 : 35 μ. Prothorax, length 120-132, transverse. B.1 and 3 of antero-marginal bristles of pronotum 52-56, b. 2 and 4 : 112-120 μ. Longest postero-marginal bristles 112-120 μ. Pre-basal seta (m) wanting.

Pterothorax, length 277-295, width 260-295 μ. Metascutum, as usual, with indistinct reticulation, with two pairs of setae on fore margin, the longest of which (interior) reaching hind margin. Wings comparatively very broad, length 692-727, width at first cross-bar 64-72 μ. Veins inconspicuous. Costa with 22-24, upper vein with about 10 (4 basal, 6 distal) bristles, lower vein with 7-8 bristles. First lower vein bristle situated at the fork. Length of costal bristles at first cross-band 120-136 μ, at second cross-band. Hind tibiae, length 160-173 μ. Bristles 1, 2 on segment IX of abdomen 76-80 μ.

Male : Similar in coloration, but much paler, antennae wholly grey, and thorax with distinct grey shadings. On the abdomen, the anterior segments are usually distinctly shaded with pale grey. Bands on wings shorter than in the female Dark specimens have fore and middle legs shaded at margins, pale specimens have only fore tibiae slightly shaded. The male is of heavier build than that of *longicornis*, its wings are longer than in this species, and the wing veins are often more conspicuous than in the female. Wings, length (3 specimens) 467-502 μ. All glandular areas, strongly transverse, dumb-bell-shaped, area on VIII 124-128, in width. B.1 of the dorsal bristles of segment IX situated far forward, length 36-44 μ, about on a level with a pair of very small lateral dorsals (16 μ) ; b.2 shorter than b.1, 24 μ, b.3 long, curved, 64-66 μ ; b.2 and b.3 are inserted near hind margin of segment.

The larvae of this species (cf. *Bull. Soc. Roy. Ent. d'Egypte*, 1929, p. 219) may be distinguished from those of *longicornis* by the lengths of their bristles.

Habitat : Types and paratypes from Cairo-Dokki, 7.vii.1937, on *Citrullus vulgaris*, infested with *Tetranychidae* that were identified by Dr. Taher Sayed as *Eotetranychus cucurbitacearum*. The species may occur on the same plant, even the same leaf together with *Sc. longicornis*. Other specimens were obtained : on *Helianthus* sp., Meadi, 13.viii.19 (leg. A. Dampf) ; on *Prunus persica*, at Beni Suef, 3.viii.1929 ; Cairo (Orman Garden), 10.ix.1929, on *Convolvulus arvensis ;* Helwan, 20.viii.1929, on *Psidium guyava ;* Shibeen-el-Kom, 4.vii.1929, on *Citrullus vulgaris ;* Borgash, 31.vii.1932, on *Cucumis melo ;* Cairo-Dokki, 19-20.ix.1949, on leaves of *Ricinus communis ;* Dakhla (oasis), 21.iii.1932, swept in orange grove. — Males I also saw from the Crimea (Nikita, Botanical Gardens), 21.xi.1929, on *Soja hispida*, leg. Fedorov.

Distribution : Europe, Canary Islands and Egypt.

Scolothrips brevipilis Priesner

1936. *Scolothrips brevipilis* Priesner, *Bull. Soc. Roy. Ent. d'Egypte*, p. 83.

This Sudanese species is known in the male sex only. Its differences from the males of other species may be seen from the key below.

Scolothrips lanzarotensis Priesner

1933. *Scolothrips lanzarotensis* Priesner, *Stettiner Ent. Zeitg.*, 94, p. 194.

Characterized by the grey antennae, the strong infumations of the body, particularly the sides of the head and the pterothorax, on whitish ground. The bristles are colourless, the fore femora and tibiae slightly shaded. Length of antennae about 192 μ, joint 5 : 25(16), joint 6 : 36(15) μ. Major bristles on pronotum 78-90 μ. Presence or absence of seta (m) on pronotum unknown. Wings, length 588-605, width 50 μ. Veins inconspicuous.

In its coloration, the species comes near *latipennis*; it specifically differs by the narrow wings, from *quadrimaculatus* by the colour of the prothorax and somewhat longer antennae.

Distribution : Canary Islands.

Scolothrips quadrimaculatus Priesner

1933. *Scolothrips quadrimaculatus* Priesner, *Stettiner Ent. Zeitg.*, 94, p. 195.

Like *rhagebianus* and *indicus*, this species has two pairs of small dots on the pronotum, slight shadings on the pterothorax and abdomen. Base of antennae hyaline. Fore wing, besides spot in basal half of scale, with only one cross-band (spot), differing in this character from all other known species. Antennae short, 176 μ, joint 5 : 20(14), jonit 6 : 33(15) μ. Major bristles on prothorax measuring about 76 μ. Seta (m) of pronotal disc is probably present (?). Length of wing 606-623, width 46-48 μ. Veins conspicuous.

Habitat : This species was like the former discovered by E. Titschack on the Canary Island Lanzarote.

Scolothrips azura Ramakrishna and Margabandhu

1931. *Scolothrips azura* Ramakrishna and Margabandhu, *Journ. Bombay Nat. Hist. Soc.*
1945. *Scolothrips azura* Shumsher Singh, *Ind. Journ. Ent.*, VII, p. 163.

This species should be easily recognized by the dark brown coloration of the antennal base and the body, as described in the key below. Legs whitish. Wings shaded up to the middle, and there is a very long dark band in their apical portion, leaving extreme apex pale. Antennal 6 more than twice as long as joint 2.

Habitat : India, Coimbatore, on leaves of *Musa*.

Scolothrips acariphagus Yakhontov

1929. *Scolothrips acariphagus* Yakhontov, *Zool. Anzeiger*, 83, nos. 11-12, pp. 273-274.

This species must come very close to both, *uzeli* and *longicornis*. The

description given by the author requires some remarks. Yakhontov states that ocelli are not discernible : it is, however, very unlikely that a winged *Scolothrips* should have no ocelli : they were simply overlooked. Yakhontov compares with my description of *longicornis* and finds "8 Borsten am Vorderrand des Prothorax anstatt 6." The truth is that in all species of *Scolothrips* I know, there are 10 bristles at the fore margin of the prothorax, sc. 5 pairs. Of these, two pairs of bristles are long (major bristles) and stouter, three pairs are short and weaker. Of the three latter bristles, b.1 (the first pair, counted from the median line) is longest, and this I had counter as major bristle in my description of *longicornis* (Thys. Eur., p. 240), thus Yakhontov was obviously misled by my statements. Yakhontov finds another difference in the number of lateral prothoracic bristles : "An den Seiten des Prothorax sind bei *Sc. acariphagus* im Vergleich zu *longicornis* je eine Borste mehr vorhanden und am Hinterrand des Prothorax 2 überzählige Borsten." Also in this case, Yakhontov counted the minor bristles, i.e. only one of them, as there are on the lateral margin actually one pair of major and *two* pairs of minor bristles present. As to the hind margin, Yakhontov says : "Am Hinterrand des Prothorax befinden sich zu beiden Seiten je zwei sehr lange Borsten und je eine kürzere ; ausserdem ist am Hinterrand des Prothorax noch ein Paar Langborsten vorhanden." On the hind margin, there are actually in all species *three* pairs of major, and *one* pair (b. 2) mostly somewhat shorter (cf. Priesner, l.c. p. 240) bristles present, i.e. altogether four pairs. Yakhontov indicates this in the description of the species, while he mentions at the beginning that the hind margin bears an accessory pair. This is a contradiction, if he does not mean seta (m) which, though not present in *longicornis* or *uzeli*, may well be developed in *acariphagus*.

In any case, *Sc. acariphagus* can be thoroughly known specifically only after re-examination of the types. From the characters given by Yakhontov, the species differs from *uzeli* and *longicornis* only by the longer 8th antennal joint. The author gives the following measurements for the antennae : 17-21, 29-36, 29-37, 29-37, 29-37, 40-49, 10-13, 18-20 μ. The great variations in the measurements of the intermediate antennal joints may even indicate that he had more than one species at hand.

***

The following keys may aid in the identification of the species. *Scolothrips acariphagus* I had to omit.

1. Females (4)

1(26) Base of antennae paler than the rest, or antennae uniformly pale grey. Basal infumation on fore wing (across scale) short.

2 (9) Bristles on pronotum and on wings pale, almost hyaline (4). Body, and sometimes legs, with greyish shadings, especially the abdominal tergites with pale grey, transverse darkenings.

3 (4) Wings broad, their width across first cross-band 60-68 μ. Antennae (from joint 2) grey. Body comparatively stout, short. Minor seta (m) on pronotum wanting or vestigial .... **latipennis sp.n.**

4 (3) Wings narrow, their width across first cross-band about 50 μ.

5 (8) Pronotum with small, dark spots in posterior portion (4). Base of antennae hyaline, antennae shaded from joint 3 (or apex of it) onwards. Wing veins conspicuous.

6 (7) Fore wings with spot on scale, and two comparatively long cross-bands, dark. Pre-basal seta (m) on disc of pronotum present, 32-40 μ. .... **rhagebianus sp.n.**

7 (6) Fore wings with spot on scale, and only one (the proximal) cross-band dark .... **quadrimaculatus Pr.**

8 (5) Pronotum without dark spots, nearly wholly pale, but head at margins, and pterothorax nearly wholly shaded. Antennae entirely pale grey. Wing veins inconspicuous .... **lanzarotensis Pr.**

9 (2) Most of the bristles of pronotum, or at least those on dark bands of wings shaded. Wings usually narrow, width across proximal cross-band (at the most) 60 μ.

10(15) Base of antennae hyaline. Body and legs without darkenings, pale yellow or orange. Cross-bands of wings short or moderately long.

11(14) Scale of fore wing dark at base, hyaline in apical half or third.

12(13) Antennae shorter, joint 5 : 25-27, joint 6 : 36-40 μ. Basal cross-band smaller than distal one, *not* attaining *fore* margin of wing, second (apical) cross-band nearly always longer than broad. Breadth of wing across first cross-band 44-55 μ. Seta (m) on disc of pronotum well developed, 28-40 μ. .... **pallidus (Beach)**

13(12) Antennae longer, joint 5 : 31-34, joint 6 : 43-46 μ. First cross-band of fore wing smaller than second, sometimes not attaining *hind* margin, but always reaching *fore* margin, both bands short, spot-like. Wing bristles longer, costal brsitles at first cross-band more than

(4) The colour of the body and its appendages, characteristic for every species, has to be examined on white paper, not in transmitted light. Specimens that have been kept in alcohol, or mounting media other than Canada balsam, may have lost their natural colours, and are thus unfit for reliable identification.

120 μ in length. Pre-basal seta (m) on disc of pronotum wanting. Bristle 1 of fore margin of pronotum 40 μ. .... **longicornis Pr.**

14(11) Scale of wing shaded, only narrowly hyaline *at margins*, in apical half (or less). Antennae about as in *longicornis*, major bristles of body shorter, b.1 of fore margin of pronotum 20-25 μ. Cross-bands of fore wing longer than in *longicornis*. Seta (m) on disc of pronotum wanting .... **uzeli (Schille)**

15(10) Antennal joints 2 to 8 shaded, more or less pale grey. Body with darkenings.

16(23) Antennae shorter, joint 5 : 24-31 μ in length.

17(18) Pre-basal seta (m) on disc of pronotum wanting. Head, prothorax and abdomen pale yellow or orange-yellow, pterothorax, at least laterally, distinctly infumated. Bristles on hind margin of pronotum and those on cross-bands of wings dark, others hyaline. Anterior cross-band reaching fore margin, and with pale incision in front. Scale slightly shaded at extreme base .... **hartwigi sp.n.**

18(17) Pre-basal seta (m) on disc of pronotum well developed, though sometimes small.

19(20) Prothorax evenly, and all tibiae shaded with pale grey. Bristles on body and wings comparatively short, costal bristles at proximal cross-band 84-100 μ in length. Seta (m) on pronotum small, 18-20 μ. Cross-bands on wings long, second band about twice as long as broad. Antennae, from joint 2, rather evenly shaded with grey ... **hoodi sp.n.**

20(19) Prothorax with two pairs of discal spots which may be fused. Body and wing bristles longer. Seta (m) longer.

21(22) Abdominal tergites with transverse shadings at fore margins and with lateral spots, too. Legs pale yellow. Joint 6 shorter, 35 μ. .... **indicus sp.n.**

22(21) Abdominal tergites with pale grey shadings, but without *lateral* spots. Legs having at least fore femora somewhat infumated, but usually also post-basal rings on tibiae. Width of wings 57-62 μ. Length of joint 6 : 40-45 μ. .... **sexmaculatus (Perg.)**

23(16) Antennae longer, joint 5 : 31-36 μ. Seta (m) on pronotum wanting or vestigial.

24(25) Width of wing (at first cross-band) about 36 μ. Longest costal bristle at distal cross-band at most 100 μ. Scale shaded up to its apex, only sides hyaline, apically. .... **cf. uzeli (Schille)**

25(24) Wings broad, width at first cross-band 70 μ. Longest costal bristle at distal cross-band 128-140 μ. Scale hyaline in distal half or third .... **takahashii sp.n.**

26 (1) Antennal joints 1 and 2, pterothorax, base of abdomen and segments

6 to 8 dark grey with profuse red pigment; prothorax, rest of antennae, middle and apex of abdomen yellowish to white. Legs pale. Wings with fuscous infumation up to middle, a small hyaline patch just beyond base, middle region broadly transparent, then with fuscous cloud almost to apex, the latter being clear .... **azura Ram. and Marg.**

2. Males

1 (4) First (median) pair of bristles on posterior margin of tergite IX situated in one transversal row with bristles 2, 3 and 4.

2 (3) The three basal glandular areas (on sternites III to V) 132-153 μ broad. Width of fore wing at first cross-band 48-50 μ. .... **sexmaculatus (Perg.)**

3 (2) The first three glandular areas have a breadth of 108-125 μ. Width of fore wing at first cross-band (not scale spot) 39-42 μ. .... **pallidus (Beach)**

4 (1) First pair of dorsal bristles on tergite IX, and third pair (very small) situated somewhat basad from hind margin; the extreme hind margin, therefore, bearing two pairs of bristles only instead of four, namely bristles 2 and 4.

5(10) Dark cross-bands of wings short. Bristle 4 on segment IX long.

6 (9) Wings fully developed.

7 (8) Minor prothoracic bristle (m) wanting. Wings broad, their width at proximal cross-band about 50 μ; length of wing 415-485 μ. Most of vein bristles hyaline. Body and legs with slight shadings. Antennae short. .... **latipennis sp.n.**

8 (7) Minor bristle (m) on pronotum conspicuous. Wings narrow, at proximal cross-bar about 40-43 μ wide, length of wing about 400 μ. Most of vein bristles shaded. Body with slight shadings. Legs pale. Antennae moderately long. .... **indicus sp.n.**

9 (6) Wings narrow, short, pointed (f. hemimacroptera). Bristles of wings dark. Body and legs pale yellow, without infumations. Antennae longer, 188-192 μ. Minor seta (m) wanting. .... **longicornis Pr.**

10 (5) Cross-bands comparatively very long, bristles on bands dark, others pale. Prothoracic and other body bristles short, b.4 on segment IX only 52 μ in length. Macropterous. Minor seta (m) wanting .... **brevipilis Pr.**

BIOLOGICAL NOTES ON SCOLOTHRIPS

From the taxonomic part of this paper it appears that the *Scolothrips* problem is not so simple as it was thought before. We have to deal with a

good number of different species, and I am convinced that many more species await discovery. Most of the literature records on *Scolothrips* are either incorrect or inexact, for in most cases the insects were wrongly identified. This may not be of great importance economically, though we have to presume that the various species differ at least somewhat in their life habits.

The first note on the habits of these insects was given by Pergande (39) ([5]) in 1882. This author states that *Sc. sexmaculatus* was "found on many plants infested with red spider, on which it has repeatedly been observed to feed."

In 1896, Beach (9) states that *Sc. pallidus* (B.) was taken on bean, blackberry, elm and hop, but we do not know exactly if all her material consisted of one *Scolothrips* species only.

Hinds (19) quotes the above host plants and mentions Bruner's statement (reference not available) that the thrips feeds "on mites in fold of cotton-wood leaf."

Back (2), in 1909, found *Sc. sexmaculatus* (?) ([6]) feeding on red spider on citrus and weeds in spring. Similarly various authors have stated the predacious habits of these insects.

In 1913, Quayle (52, 53) observed *Sc. sexmaculatus* (?) feeding on the citrus red spider (*Tetranychus mytilaspidis* Riley) most abundantly during winter and spring in California; generally eggs and young spiders are eaten, the spiders being mostly attacked just before the first and second moult; larvae and adults of the thrips have been observed feeding on the mites.

In 1914, McGregor (31) notes *Sc. sexmaculatus* (?) as enemy of *Tetranychus bimaculatus* Harv.

Shtsherbakov (59) records a *Scolothrips* (under the name of *sexmaculatus*) from Russia (1913), considering it to have been imported from North American cotton plantations; but this record refers almost certainly to one of the Old World species (*longicornis, uzeli* or *latipennis*).

Mc. Gregor and Mc. Donough (32) report *Sc. sexmaculatus* as a voracious feeder on the red spider on cotton in U.S., particularly attacking the eggs, but being itself destroyed by *Triphleps insidiosus*.

In Florida, Moznette (36, 37) reports *Sc. sexmaculatus* (at least partly identical with *pallidus*) as predator on larvae and adults of *Tetranychus yothersi* Mc.Gill. on the avocado.

Garman (17) mentions *Sc. sexmaculatus* (?) as natural enemy of *Paratetranychus pilosus* C. and F. in Connecticut apple orchards.

([5]) Figures referring to numbers of list of publications, pages.....

([6]) In this as in all further quotations concerning North American records not only *Sc. sexmaculatus*, but any of the four North American species may be concerned.

Piontovskii (40) finds a *Scolothrips* in the larval and adult stage attacking *Epitetranychus* spec. on cotton in Turkestan, in 1928.

In 1929, Newcomer and Yothers (38) give quantitative notes on *Sc. sexmaculatus* (?) in North California, the insect consuming, according to these authors, all stages of *Paratetranychus pilosus* C. and F., but showing preference for the eggs. One full grown thrips larva was observed to consume 55 eggs, 34 larvae, 7 nymphs and possibly 6 adults in 3 days.

According to Mahoney (30), *Sc. sexmaculatus* (?) was able to effectively reduce a summer attack of the *Tetranychus pacificus* Mc.Gill. in the San Joaquin County, in 1929.

Cherian (10, 11) found a *Scolothrips* (probably *indicus* Pr.) in the larval and adult stage feeding chiefly on the eggs of *Paratetranychus indicus* Hirst in South India.

According to Polizu (41) large numbers of eggs of the vine mite (*Tetranychus althaeae* Hanst.) were destroyed by the larvae of *Sc. longicornis* Pr., in Bessarabia.

Lamiman (29) says that *Sc. sexmaculatus* (?) destroys small colonies of *Tetranychus pacificus* in the spring in California.

Yakhontov (64, 65) considers *Sc. acariphagus* Yakh. (most likely identical with *longicornis* Pr.) as one of the most important natural enemies of *Tetranychus althaeae* Hanst. in Central Asia.

In 1938, Speyer (61) received living material of *Sc. sexmaculatus* (?) from California for the control of *Tetranychus telarius* L. in England, but the introduction seems not to have been successful.

Garman (18) gives an interesting note on the hibernation of *Sc. sexmaculatus* (?) (on *Paratetranychus pilosus*), stating that the thrips passes the winter under bark of stems or major branches of trees.

The most important paper on the biology of *Scolothrips sexmaculatus* (?) (probably chiefly *pallidus* (Beach)) was given by Bailey (8), in 1939. In this species, as it is the case with all Egyptian species, the whole life cycle is passed on the host plant. Eggs are inserted in the tissue of the leaves. Reproduction, at least usually, bisexual, but males less common than females (2:1). Eggs are laid in small numbers. Egg stage may last 6-10 days (in summer at Davis, California), but can no doubt be shorter under optimal conditions. Larval stage lasts 5 to 21 days, according to temperature, prepupa 1 day, pupa 3 to 5 days. The adults live from 2 to 3 weeks. Particularly interesting is Bailey's observation on that on plant food the adult can survive only 3 days. Larvae and adults, as it was known already, feed on all stages of the mites. Cannibalistic habits were observed. The contents of a mite egg are sucked up in one-half to one minute, but it takes from 5 to 20 minutes for feeding on an adult mite. One adult thrips has been

observed in one half hour killing three mites and feeding on 6 eggs. Bailey is of the opinion that rather long intervals between feeding are generally evidenced and that it cannot be said that *Sc. pallidus* is exactly voracious. Numbers of thrips may be great occasionally, particularly in autumn, and as many as 50 individuals (of various stages) were counted on one walnut leaf. The population seems to be very small in winter, actual hibernation could not be ascertained by the author. Bailey does not consider *Scolothrips* as of any great importance economically owing to the great difference in the reproduction rate between the mite and the thrips.

In 1938, Fedorov (16) (see also Blunck, Handbuch d. Pflanzenkrankheiten, Bd.IV, 5.Aufl., 1950, p. 399) reports *Sc. longicornis* as feeding on the leaves, shoots, flowers and pods of soy beans in the Crimea. This is certainly an erroneous statement, as I have myself seen the same species feeding on mites (*Eotetranychus cucurbitacearum* Sayed). Fedorov has no doubt confused another yellow thrips (perhaps *Thrips flavus* Schrk. or *Thrips tabaci* Lind.) with *Scolothrips* (cf. Polizu (41) and Yakhontov (64, 65)).

In Egypt, three species of *Scolothrips* occur, of which *Sc. rhagebianus* Pr. seems to be confined to the south of the country, being distributed from Beni-Suef to Wadi Halfa; it is not very common. Unfortunately we do not know, as yet, if it is confined to one species of mites only, or if it attacks more than one species. Its occurrence on peach and cucurbits suggests the latter alternative.

The two other Egyptian species, *Sc. longicornis* and *Sc. latipennis* are more common and more widely distributed. The former feeds on *Eotetranychus cucurbitacearum* Sayed, living on *Citrullus vulgaris*, *Convolvulus arvensis* and *Tropaeolum majus*; on *Anychus orientalis* Zach. on its host plant *Ricinus communis*; and on unidentified mites (*Tetranychidae*) on leaves of *Pisum*, *Datura*, *Ipomoea batatas*, *Bauhinia*. *Scolothrips latipennis* normally occurs in greater numbers than *Sc. longicornis*, but often together with it on one plant, even on one leaf of *Citrullus vulgaris*, or *Convolvulus arvensis*, feeding on *Eotetranychus cucurbitacearum*. It was also found on *Cucumis melo* and on *Helianthus annuus* (leaves) where it most likely feeds on the same Tetranychid, furthermore, on *Ricinus communis*, feeding on *Anychus orientalis* Zach. and on *Psidium guyava* (leaves), which is attacked by the mite *Brevipalpus pyri* Sayed. It was repeatedly observed feeding on eggs and later stages of *Eotetranychus cucurbitacearum* Sayed. At least *Scolothrips latipennis* is distributed all over the Nile Delta, and I saw it in Upper-Egypt as far south as Oasis Dakhla.

My observations on the economic value agree with Bailey's made in California (as to *Sc. pallidus* (Beach)) : Though it may be said that slight

infestations by the Tetranychids, as are often seen on *Cucurbitaceae* can well be held down by the activity of *Scolothrips*, severe attacks do not show to be effectively influenced by these predators, obviously, since their rate of reproduction is considerably lower than that of the *Tetranychidae*, as it is particularly evident in mite infestations on the castor oil plant.

LITERATURE ON SCOLOTHRIPS
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Further Studies in *Haplothrips* and allied Genera

[Thysanoptera]

(with 1 Plate)

by Prof. Dr. H. PRIESNER

Since the publication of my review of the *Haplothrips* species of Europe (Thys. Eur., 1927-28, pp. 564-628), and those of Africa (*Bull. Soc. R. Ent. d'Egypte*, 1931, pp. 230-274), many new species were discovered and described, particularly by Bagnall (*Ann. Mag. Nat. Hist.*, 1926-1934) and myself (in this Bulletin), necessitating a new review of this genus with regard to the faunas concerned. In 1936 (this Bulletin, pp. 61-75) I showed that the chaetotaxy of the microsetae may be utilized for the differentiation of many species. Fábián (*Fol. Ent. Hung.*, IV, fasc. 1-2, 1938, pp. 7-36, pl. I-IV) has studied the Hungarian species, and has examined, described and illustrated the male genital organs of many species, following my hint (Thys. Eur., p. 46) as to the possibility of making use for the separation of the species, of the shape of the aedeagus characteristical to practically every one. To the description of further new African and Palestinian species, I gave, accordingly, in this Bulletin (1939, pl. II), illustrations of the "pseudovirga," as Fábián terms the strongly sclerotized apical portion of the aedeagus.

Previously, one could fairly well distinguish the females of the members of this genus, while the males, owing to their greater variations in the measurements of head, antennae, thorax and bristles, were much more difficult to identify. The shape of the pseudivirga, constant in every species, both in their gynaecoid or oedymerous form, offers an extremely valuable means for distinguishing similar species.

In order to exactly compare the aedeagi of the different species it is essential that this organ lies in the preparation exactly horizontally, and it is, therefore, at first necessary to get it exserted. Killing the insects in 70%

alcohol (with a few drops of acetic ether) will give the result desired. The best method, however, consists in removing the distended genital organ from the body, and in mounting it separately under another cover glass on the same slide on which the male belonging to it is mounted. I do not advise to use Berlese's fluid as mounting medium, but, in spite of its more favourable index of refraction than Canada balsam, I can only recommend the latter, for it is the only medium giving durable preparations.

In this paper some new species are dealt with, new records and notes on synonymy, and a table for identification of the species hitherto known from Europe and Africa, are given, whereby both sexes of the various species are dealt with separately, as far as this was thought necessary.

I am much indebted to Dr. R.S. Bagnall and Prof. Dr. H. Sachtleben for many kindnesses, especially for the opportunity to examine type specimens from their collections, and to Boutros Assaad Eff. for the excellent drawings, illustrating the descriptions of the new species.

Au~~t~~othrips gen. nov.

Near *Haplothrips*. Antennae short and stout, 8-segmented, joint 3 asymmetrical, 3-6 with very short and broad pedicel, joint 3 with two, 4 with four sense-cones. Head slightly longer than broad, postocular bristles extremely minute. Prothorax shorter than head. Major body bristles very short and stout, hyaline, much widened apically, infundibuliform and fringed, like in *Scopaeothrips*. Disk of pronotum comparatively well furnished with microsetae. Legs stout, fore legs somewhat incrassate in both sexes, fore femora with apical margin reflexed as in *Chiraplothrips* and *Euryaplothrips* Wings moderately long, distinctly narrowed at middle, with double fringe. Tube short.

Typ. gen : *Aulothrips nubicus* spec. nov.

Differing from *Haplothrips* by the shape of the fore femora, from *Chiraplothrips* by the presence of four sense-cones on joint 4, from *Euryaplothrips* by the more elongate head, from all three genera by the form of the major body bristles which are unique in the whole group.

Aulothrips nubicus spec. nov.

Female : Blackish brown with crimson to orange mesodermal pigment. Femora, middle and hind tibiae and tarsi dark, fore tibiae paler at apex, fore tarsi yellowish. Antennae dark, joint 3 greyish yellow, paler at base, 4 dark or somewhat paler at base. Wings hyaline, basal plate dark only up to bristle 3. Body bristles hyaline or nearly so, wing retaining spines and anal setae dark.

Head little longer than broad, 225(200-205), lateral length of eyes 65,

cheeks behind them 160-165 μ, little arched, in front broader than eyes. Postocular bristles extremely small, 8-12 μ distant from eyes. Mouth-cone very broadly rounded. Antennae short, joints 3-6 very short, broadly pedicellate, 7 broad at base, but with distinctly separated basal rim, 8 scarcely narrowed at base; 3 with two, 4 with 2+2, 5 and 6 with $1+1^{+1}$, 7 with 1 (dorsal) sense-cones. Total length of antenna, 280 μ. Lengths (breadths) of joints : 25 (base 32, apex 25), 42(29), 39-41(26), 42(28), 39(27), 39(25), 31(19), 22(11) μ. Prothorax short, 130(304) μ, all antero-marginal bristles very small, epimerals and postero-marginals short, 25 μ at the most, hyaline, thick, widened toward apex, funnel-shaped and fringed. Disc comparatively well provided with microsetae. Legs short, fore legs somewhat enlarged, apical margin of fore femora as in *Euryaplothrips*, reflexed and sharp-edged, fore tarsi with conspicuous small tooth. Pterothorax, length (width) 260-295(294-345) μ. Fore wings moderately long, 640 μ, moderately broad, distinctly narrowed at middle, with 7-11 (usually 9-11) cilia duplicated; basal wing bristles very short, posited in a triangle, hyaline, widened apically, fan-shaped, fringed, lengths 12-14, 14-16 and 22-24 μ, respectively. Bristles at sides of abdomen curved, somewhat widened towards tips, blunt; b.1,2 on segment VII : 28-32, lateral bristle on VIII : 32; bristle 1 on segment IX slenderer than prothoracics, but widened towards tip, rounded, nearly lanceolate, 28-33, sometimes slenderer, 35 μ; b. 2 pointed, 40-46 μ. Pores on tergite VII not very closely approximated, with two pairs of microsetae as on segment VIII. Tube short, length (width) 104-112 (base 100, apex 51-56). Longest anal setae (laterals) 105 μ.

Male : Gynaecoid form similar to female. Aedeagus (Plate, fig. 1) slender, little narrowed before apex, decidedly split. Measurements (of allotype), in μ : Head, length (width) 190(170), lateral diameter of eye 72, length of cheeks behind them 124. Antennal joints, lengths (breadths) : 18(26-27), 40(24), 40(24), 42(25), 38(24), 37(21), 30(16), 21(10). Prothorax, length (width) 132(265). Epimeral bristles 32. Pterothorax, width 303. Wings length 675. Bristle 1 on segment IX : 54, blunt, b.2 very short (spine-like) 16-20, b.3 pointed, 58. Tube, length (width) 114 (basal 52, apical 31), dorsal length 105.

Habitat : Egypt, Gebel Elba, in flowers of *Statice* spec., leg. Moh. Hussein.

Haplothrips Serv.

Haplothrips anthemidinus spec. nov.

Female : Blackish brown to black, with profuse crimson pigmentation. Legs wholly dark, fore tibiae and tarsi grey-brown, little paler.

Antennae wholly dark, joint 3 pale at pedicel only. Basal plate and scale of the nearly wholly hyaline wings strongly darkened, the basal bristles are situated within the darkening. Major body bristles hyaline or nearly so, anal setae darkened.

Head of holotype, length 168-172, width 172 μ, lateral diameter of eye 64-68, length of cheeks behind them 112-120 μ. Cheeks slightly rounded. Postocular bristles well developed, about 56 μ, pointed. Mouth-cone short, rounded. Antennae moderately long, joint 1 narrowed towards apex, 3 *strongly convex interiorly*, 7 not pedicellate, but constricted at base, 8 narrower at base than 7 at apex, parallel-sided in basal third; joint 3 with two sense-cones, the following joints as usual; measurements of joints of holotype : 20-22 (base 28, ap. 22), 42-45(28), 31(27), 50(31), 48-49(27), 42(22), 41-42(18), 31(11) μ. Prothorax, length (width) 116(260); antero-angular setae very small, epimerals 56-60 μ, pointed or scarcely blunt; interior postero-marginals developed. Fore tarsi with *very* small tooth. Pterothorax, length (width) 330(328-337). Wings moderately broad, length 813-850, distinctly narrowed at middle; bristles 1 and 2 of wing base usually rounded at tips, seldom nearly pointed, 56-64 μ, B.3 : 64-76 μ; fringe cilia somewhat roughened or very slightly plumose, 3-6 cilia duplicated. On tergites VII and VIII only one pair of micro-setae near the median micro-pores, the latter of segment VII rather closely approximated; b.1 on segment VII about 88, b.2 : 76-80, pointed, on segment VIII, b.1 : 48, b.2 : 68 μ; on segment IX, the bristles are comparatively short, b.1 : 64-72, b.2 : 40-56 μ, exceptionally about 64 μ. Tube moderately long, 140(dorsally 132), width at base 58, at apex 31-32 μ; tube somewhat concave behind basal thickening. Longest (lateral) anal seta, 80-92 μ.

M a l e (oedymerous) : Fore tibiae yellow towards apex, fore tarsi yellow. Fringe distinctly plumose. Tooth of fore tarsi stout, triangular. Antero-angular pronotal bristles very small, epimerals pointed (48-56 μ). Basal wing bristles and bristles on segment IX of abdomen pointed. Fore wings having 4-6 cilia duplicated, in two cases 0-1 only. Pseudovirga peculiar, stem broad, widened towards apex, distal half nearly spoon-shaped, bipartite (Plate, rig. 2) Measurements (of a l l o t y p e) in μ : Head, length 192, width 182; lateral diameter of eyes 80, cheeks behind eyes 124; postocular bristles 60. Antennae, lengths (breadths) of joints : 22 (base 28, apex 25), 48(28), 59(28), 62(31), 59(26), 53(21), 48(18), 32(11). Basal wing bristles : 52, 52 and 68. Bristles on abdominal segment IX : 88-92, 28-36 (spine), 87-96. Tube, length (width) 172 (base 60, apex 36), weak specimen : 140(51 : 31). Longest anal setae, 116.

H a b i t a t : Palestine, Wadi Kelt, 8.iv.1936, in flowers of *Anthemis* spec.; a specimen from Sinai, Wadi Umm-Mitla, 14.iii.1937, leg. A. R a b i n o v i t c h, I have to refer to this species.

This species is in the female sex extremely similar to *chrysanthemi*, so much so that I can only distinguish it from *small* specimens of the latter by the shorter basal wing and abdominal bristles. In the smallest specimens of *chrysanthemi* (head length 152 μ), b.3 of the basal wing bristles measures 72, and b.1 of segment IX, 72-76 μ, b.2 : 64-68 μ, while in normal specimens b.3 of the wing base has a length of 80-89, b.1 of segment IX 76-92 μ. The antennae are of exactly the same type in every detail. The male, however, is easily separated by the peculiar shape of the pseudovirga, being the same in all (six) specimens I was able to examine.

Haplothrips jasionis spec. nov.

Female : Blackish brown or darker, middle and hind tarsi dark, fore tibiae gradually paler towards apex, fore tarsi yellow grey. Antennae dark, joint 3 pale yellow at base, exteriorly often so up to the middle, 4 wholly dark or pedicel pale. Postocular, prothoracic and basal wing bristles slightly greyish, bristles at sides of abdomen pale, those on segment IX often slightly infumated, anal bristles darker. Wings hyaline or very slightly shaded in basal half, basal plate dark to bristle 3 or more extensively.

Head, length 192-200, width 176-200, lateral diameter of eye 64-72, cheeks behind eyes 136-140 μ. Postocular bristles well developed, 55-60 μ, nearly pointed. Mouth-cone short, rounded. Antennae : Joint 1 little narrowed towards apex, 3 strongly conical, slightly asymmetrical, the following joints, even 7, somewhat pedicellate at base, 8 parallel-sided basally. Measurements of antennal joints (holotype), in μ : 22 (base 31, apex 28), 48(30), 49-50(30), 56(34), 52-53(30), 50(25), 42(20), 36(12) ; joint 3 with two sense-cones, the following joints as usual. Prothorax, length (width without coxae) 128(295) : antero-angular bristles very small, epimerals 65-76 μ, well developed, narrowly rounded at tip. Legs stout, fore tarsi with small, but conspicuous tooth. Pterothorax, length (width) 310-330(320-363) μ. Wings moderately broad, distinctly narrowed at middle, length 848-865 μ ; basal bristles rounded at tips or slightly knobbed, their lengths 44-48, 44-52 and 48-62 μ ; fringe smooth, 6-9 cilia duplicated. Pores in the middle of tergite VII usually much approximated, VII and VIII with only one pair of micro-setae ; bristles at sides of abdomen long, b.1,2 on VII : 104, b.1 on VIII : 52, blunt, b.2 pointed, 87 μ : b.1 on IX 72-80, rounded at tip, b.2 pointed, 76-85 μ. Tube conical, somewhat thickened basally, length 144-152 (dorsally 140), width at base 58-64, apically 39-39 μ. Longest anal setae 128-140 μ.

Male : Fore tibiae more extensively pale, dark only at base. Number of double fringe cilia as in the female, basal wing bristles as long as in the female, not quite sharp. Tube slender. Pseudovirga slightly widened towards apex, the latter narrowly lanceolate, tip narrowly rounded (Plate, fig. 3).

Measurements (of allotype), in μ : Postocular bristles 65. Antennae (of oedymerous type) : 20 (base 31, apex 25), 20(25), 45(27), 50(27), 53(31), 52-53(26), 50(21), 45(20), 32(11). Bristle 1 on segment IX of abdomen (not quite pointed) 76-80, b.2 (spine-like) 25, b.3 : 108, pointed. Tube length (width) 160(56 : 35). Longest anal setae 133.

Habitat : Austria, Haslach, vi.1920; Linz, 15.vii.1948, in flower heads of *Jasione montana* (leg. H. Priesner). England, Hayling, 17.vii. 1938, *Jasione*, leg. R.S. Bagnall.

Larva (second stage : Dark red (crimson), antennae dark or joint 3 paler. Antennal joints : 14(27), 28(20), 39(20), 42(22), 34(19), 28(14), 22(8) μ. Postocular bristles 45-50 μ. Bristles 6 of prothorax 60-65, b. 7 : 16-20, both nearly pointed. Bristles on segment VIII about 48, nearly pointed, on IX b.1 : 48-60, b.2 : 24-34, b.3 : 28-36, b. 4 : 60 μ. Segment IX, length (width) 72 (105), segment X : 63(56) μ.

I have known this species for about 30 years, but had previously considered it as a variety of *setiger*. The smooth fringe refers it to quite another group. It comes very close to *helianthemi* Oett. ; in *jasionis*, however, the eyes are decidedly smaller, the head is more elongate, and the pseudovirga is narrower at apex, the stem slenderer. The larva differs from that of *helianthemi* by its slenderer joint 3, and the shorter body bristles, the postoculars, b.6 of prothoracics and bristles of segment IX of the latter species having lengths of 48-50, circa 80 and (68-72, 36-44 and 75) μ, respectively. Antennal joint 3 of *helianthemi* measures 48-52(24-26) μ. The specimens from England were confused by Bagnall with *H. statices* Hal., Bagn.

Haplothrips purpurifer spec. nov.

Female : Blackish brown with profuse crimson pigmentation in the body. Fore tibiae not or only slightly paler at apices, fore tarsi yellow-grey, middle and hind tarsi dark. Wings, at least in basal half, more or less distinctly shaded. Prothoracic and basal wing bristles slightly greyish, abdominal bristles hyaline, anals darkened. Antennae dark, joint 3 sometimes lighter about in basal half.

A slender species of the habitus of *eryngii* or *niger*. Head slender, length 180, width 156 μ, eyes moderately long, lateral diameter 60, cheeks behind eyes about 120 μ. Postocular bristles very small. Mouth-cone broadly rounded. Antennae slender, joint 3 slightly convex interiorly, straight at exterior margin, with two sense-cones — the remaining joints with the usual number of cones —, 5 and 6 shortly pedicellate at base, 7 not so, but constricted, 8 parallel-sided at base, narrower than 7 at apex. Measurements of antennal joints of holotype. in μ : 20-24(28), 48(28), 56(28), 56(28), 49(26), 45(22), 40-42(20), 28-29(12). Prothorax, length 112-116, width (without

coxae) 216-220, antero-marginal bristles very small, epimerals small, not more than 24-40, not quite sharp, interior postero-marginals shorter. Fore femora slender, fore tarsi with *very* small tooth, about as in *eryngii*, much smaller than in *niger*. Basal wing bristles arranged nearly in one line, b.1 and 2 not sharply pointed, or all of them nearly pointed, 20-24, 32-34 and 34-44 μ, respectively. Pterothorax scarcely longer than broad, 285-295 μ. Wings narrow, slightly narrowed in the middle, fringe rather dense, smooth, having 5-8 cilia duplicated. Wings length 813-850 μ. Micro-pores on VII and VIII normal, one pair of micro-setae noticeable on each. Bristles on segment IX short, pointed, b.1 : 44-48, b.2 : 40-44, b.3 : 65 μ. Tube slender, length (width) 124-128, dorsally 118-120 (52-54 : 30-34) μ, base of tube somewhat thickened, then conical, with sides nearly straight. Anal setae, length 88-92 μ.

Male : Antennae, as usual, slenderer, with joint 3 : 60-64(26) μ in the oedymerous form. Pseudovirga spoon-shaped, basal stem 8 μ broad, the widened distal portion 18 μ in width, its sides rounded, pointed at apex, and slightly concave before apex (cf. Fábián, pl. 1, fig. 2).

Habitat : Cotypes, both sexes, Spain, Pyrénées, Farga de Moles, near Seo de Urgel, 22.vi.1930, from mixed flower material (leg. F. Diehl and G.F. Meyer).

Smooth fringe cilia and minute postoculars refer this species to the *leucanthemi*-group. It comes nearest to *eryngii* Bagn. and *setigeriformis* Fábián, but is distinguished from both by the elongate third antennal segment, the darker antennae (joint 4 wholly dark), and the distinctly infumated wings. The male pseudovirga is distinctive, but somewhat similar to that of *propinquus* Bagn., in which, however, antennal 3 is only twice as long as broad, and the pseudovirga is pointed, its sides being not concave before apex.

Haplothrips alpicola spec. nov.

Female : Blackish brown or nearly black, with crimson mesodermal pigment in the body. Legs as dark as the body, *fore tibiae dark*, scarcely paler at apices, middle and hind tarsi quite dark, fore tarsi paler, yellowish grey. Antennae dark, joint 3 more or less dark grey, yellowish in basal half, chiefly on lower surface, 4 and 5 wholly dark or lighter at pedicel only. Prothoracic and basal wing bristles shaded, those at sides of abdomen pale or slightly infumated, wing retaining spines and anal setae dark. Wings distinctly infumated for their whole length, but somewhat less than in most specimens of *leucanthemi*.

Head, length (width) 232(208) μ, cheeks slightly rounded, mouth-cone broadly rounded ; lateral diameter of eyes 84-88, cheeks behind eye 148 μ ;

setae on cheeks very weak. Postocular bristles very short, pointed, not exceeding a length of 28 μ. Measurements of antennal joints, in μ : 28 (base 40, apex 30), ? (33), 64-68(33-35), 68-70(38), 64(32), 61(28), 56(24), 40(14). Sense-cones very short, pointed, joint 2 with two, the following joints as usual. Antennal joints normal, 3-6 shortly pedicellate, 7 not so, but constricted, nearly parallel-sided at base, narrower than 7 at apex. Prothorax, length 160, width without coxae 310 μ; bristles short, but developed, antero-angulars 20-24, exterior and interior postero-angulars 32-40 μ, somewhat curved, pointed; disk with 1-2 pairs of microsetae behind fore margin. Fore tarsi with small, but conspicuous tooth. Pterothorax, length (width) 92-100 (380-407) μ. Wings about 1194 μ in length, width across double fringe 108 μ, distinctly narrowed at middle; basal wing bristles situated nearly in one line, stout, pointed or nearly so, equally distant from one another, lengths (holotype) 40, 56, 50 μ. Fringe hairs smooth. Double fringe 7-13. Micropores on tergite VII very closely approximated, micro-setae 1-2 pairs on VIII, 1 pair on VII. B.1 on segment VIII : 72, b.2 : 87 μ; b.1 on segment IX nearly pointed, 88 μ, b.2 : 80 μ, finer, pointed. Tube moderately long, not evenly conical, but somewhat concave beyond base, measuring 204 (dorsally 196) μ in length and 80 : 44 μ in width (holotype), in other specimens 204-208(72-74) μ. Longest anal setae : 160 μ. -- Male unknown.

Habitat: 4 females, Austria, Gradenalm (Kremstal, Upper A.), 7.vii.1927, on sweeping, but most likely from Composite flowers, perhaps *Senecio fuchsi*.

This species, having a striking resemblance with *H. leucanthemi*, is not identical with it. It is easily distinguished by the distinctly more conspicuous prothoracic bristles, particularly the antero-angulars, and the longer basal wing bristles. From all the species having short postoculars and elongate tube, *alpicola* differs by its larger size, the strongly shaded wings and the elongate terminal antennal joints.

Haplothrips quercinus spec. nov.

Black or blackish brown, with rich mesodermal pigmentation. Legs dark, fore tibiae, excepting dark base and dark margins, and fore tarsi pale yellow, middle and hind tarsi grey-yellow or grey. Antennal joints 1, 2, 7 and 8 as dark as the body, joints 3 to 6 pale yellow, 4 to 6 (about in apical half) pale grey brown or very slightly shaded. Wings wholly hyaline, basal plate slightly darkened only at base. *All body bristles hyaline*, only abdominal wing retaining spines and anal setae (somewhat) darker.

Head somewhat longer than broad, 196-204(180-188), lateral diameter of eyes 65, cheeks behind eyes 136-144 μ. Postocular bristles 48-60 μ, knobbed, 16-20 μ distant from eye. Mouth-cone narrowly rounded at apex. An-

tennae very short and stout, suggesting those of *gowdeyi*, joint 1 little converging apically, 3 short, strongly convex, 3-6 shortly pedicellate at base, 7 constricted at base, not pedicellate, 8 not or very slightly constricted at base, but distinctly narrower than 7 at apex; joint 3 with two, 4 with four, 5 and 6 with two, and 7 with 1d sense-cones. The slender pedicel of joint 3 is remarkable. Measurements of joints, in μ : 20-22 (base 29, apex 26), 42-45(25-26), 39(27), 45(31), 43(27), 42(23), 36(18-19), 25-28(11); total length 290-300 μ. Prothorax short, 128, width without coxae 292-300 μ; antero-angular bristles at most 32, interior antero-marginals developed, but measuring not more than 20 μ, epimerals 60-65, interior postero-marginals 45, coxals 32 (scarcely shaded), hyaline, knobbed. Fore femora slightly incrassate, fore tarsi with very small tooth. Pterothorax, length 294-330, width 328-363 μ. Wings, length 778-865 μ, *comparatively broad*, strongly narrowed at middle, about 68, before apex about 85 μ broad; basal bristles 1, 2 : 38-45, b. 3 : 56-72 μ, all knobbed, hyaline. Fringe smooth, 6-9 fringe cilia duplicated. Basal wing bristles very closely approximated, in a triangle, their distances not exceeding 26-28 μ. Legs comparatively short, hind tibiae at exterior margins measuring 188-208 μ. B.1 on abdominal segment VII, 100, b.2 : 92, on segment VIII, b.1 : 48-52, b.2 : 88 μ; these bristles are partly pointed, but those on VIII are blunt; on segment IX, b.1 is pointed, 100-105 μ, b.2 somewhat shorter. Tube, length 108 (dorsally 105), width at base 60, at apex 32; (paratype) 112(108), width at base 62, at apex 33 μ. Length of longest anal setae, 105-110 μ. VIIth and VIIIth tergite with normally two pairs of median micro-setae.

Male: Antennae somewhat darker, joint 3 infumated apically, 6 wholly dark or paler at base only, otherwise as in the female. Antennal 3 interiorly beyond base with strong convexity, exterior margin straight. Prothoracic and basal wing bristles as in the female, except b. 3 which is nearly pointed. Fringe smooth, double fringe 8-9. Pseudovirga, though not quite horizontal, slender, abruptly constricted before tip, "head" elongate. Measurements of male (allotype), in μ : Head, length (width) 188(160). Postoculars 52-56, nearly pointed. Pterothorax, width 300. B.1, on segment IX : 112-116, pointed, b.2 (spine) 33, b.3 : 120. Tube, length 120 (dorsally 116), width at base 50, at apex 32.

Habitat: 2 females (holo- and paratype) : Cyprus, Episkopi-forest, iv.1940 in flowers of *Quercus pseudococcifera;* 1 female (paratype), 1 male (allotype), ibidem, Mt. Troodos, 5500-6000 ft., vi.1937; leg. G.A. Mavromoustakis.

This species can be scarcely confused with any of the old ones; the short antennae of the female are similar to those of *gowdeyi*, and somewhat to those of *eothripinus;* the former, a grass thrips, has narrower wings,

much more widely separated basal wing bristles, and dark major bristles; *eothripinus*, perhaps a variety of *tamaricinus*, is a smaller insect, with very short terminal antennal joints and fine interior antero-marginals of pronotum, very short postoculars, etc.

Haplothrips avenae spec. nov.

Female: Brown, fully mature specimens perhaps blackish. Legs dark, middle and hind tarsi infumated, fore tarsi pale yellow, fore tibiae yellow, dark at margins. Antennae with joints 1, 2 and 6 to 8 dark, 3 pale yellow, 4 and 5 greyish yellow, 4 pale yellow about in basal half, 5 dark. Wings hyaline, basal plate shaded only up to bristle 1. Body bristles hyaline, or nearly so, only wing retaining spines and anal setae strongly darkened.

Head of holotype, length about 168, width 160-164, lateral diameter of eyes 68-72, cheeks behind them 96-100 μ. Postoculars well developed, 32-36, knobbed, 12 μ distant from eyes. Mouth-cone short, broadly rounded. Antennae short and stout, joint 3 strongly convex interiorly, 4 with broad, 5 and 6 with short, slender pedicel, 7 with very short, broad pedicel, 8 conical; joint 3 with only 1, 4 with 2+2, 5 and 6 $1+1^{+1}$, 7 with 1 dorsal sense-cone. Pronotum, length (width without coxae) 118(225) μ. Antero-angular bristles strongly knobbed, 25 μ, *interior antero-marginals very small;* epimerals 40 μ, interiors 28, both strongly knobbed. Disc with one pair of micro-setae behind fore margin. *Fore tarsi unarmed.* Pterothorax, length (width) 264-268(280) μ. *Wings very narrow*, the smooth fringe hairs not densely set, length of wings 690-710 μ; 5-6 fringe cilia duplicated (2 specimens); basal wing bristles 1 and 2 strongly knobbed, 20-25, b.3 hair like, pointed. Pores of segments VII and VIII with only one pair of micro-setae, the former 28 μ distant on VII, 72 μ on VIII. Bristles 1 and 2 on segment VIII knobbed or blunt, 48 and 68 μ, respectively; bristles on IX nearly pointed, b.1 about 60-68, b.2 longer. Tube very short, 98-100 (dorsally 90) in length, 52 μ at base, 29 μ at apex, in width. Anal setae long, the longest (laterals) about 130 μ.

Male: Antennae slenderer, similar in colour, with darkenings in apical half of segments 4 and 5, and 6 slightly pale at base. Fore femora somewhat incrassate, fore tarsi with tooth. Pseudovirga slender, with slight elongate constriction before narrowly elliptical apex. Measurements (of allotype), in μ: Head, length (width) 172(154), eyes, lateral diameter 68-72, cheeks behind eyes 100-105. Postoculars 40. Antennal joints: 22 (base 29, apex 22), 42(24), 36-38(21), 45(28), 42(24), 38(21), 36(18), 50(11). Prothorax, length (width without coxae) 126(225). Antero-angular bristles 28-30, epimerals ?. Pterothorax, length (width) 255(242-250). Tube, length 102 (dorsally 100), width at base 51, at apex 29. B.1 on segment IX about 80 (not quite sharp).

Habitat : 1 female (holotype), 1 male (allotype), Nyasaland, Zomba, 14.x.1931, on oats (*Avena*), leg. C. Smee, 3071; ex coll. Brit. Museum.

Among the species having smooth fringe cilia, short tube and no tarsal tooth in the female sex, this small new species — even if it should occasionally have a vestigial tarsal tooth — could only be confused with *tolerabilis* and *balachowskyi*, to both of which it is similar by its habitus and the pale bristles. *H. balachowskyi*, however, has a *conspicuous* tarsal tooth, more slender head and antennae, less strongly knobbed, and longer, epimerals and broader wings; *H. tolerabilis*, though agreeing in the narrow, and comparatively sparingly fringed wings, has antennae much more elongate, moreover, both species differ from *avenae* in constantly having well visible interior antero-marginal prothoracic bristles.

Haplothrips confinis spec. nov.

Female : Brown to blackish brown, profusely pigmented with crimson, within the body. All tarsi pale yellow, fore tibiae as well, darkened at base, sometimes only at margins, *middle and hind tibiae dark, but for about one-fifth to one-fourth of their length, abruptly pale yellow at apices.* Antennae with joints 1, 2, 7 and 8 dark, 3-6 pale yellow, 6, as a rule, 4 and 5 sometimes, but less marked, slightly shaded with grey. Wings and their basal bristles hyaline or nearly so, prothoracic bristles partly slightly infumated, anal setae dark.

An elongate species. Head elongate, with nearly parallel cheeks. Length (width) 168(148) μ in the holotype, lateral diameter of eyes 70, cheeks behind eyes 108 μ. Postoculars strongly knobbed, length 45, from eyes 12 μ distant. Mouth-cone broadly rounded. Antennae normal, joint 3 convex interiorly, 4-7 somewhat pedicellate, 8 not or slightly constricted at base, 3 with one, 4 with $2+2$, 5 and 6 with $1+1^{+1}$, 7 with 1 d sense-cone. Measurements of joints, in μ : 12-16(30), ?(26), 44(25), 48(28), 50(24), 44(22), 40(20), 28(12-14). Prothorax of holotype, length (width without coxae) 116(228) μ, disc behind fore margin with two pairs of micro-setae, angular and interior antero-marginal bristles well developed, fine, knobbed, the former 34-36, the latter 28 μ in length, laterals 36-40, epimerals 48, straight, strongly knobbed, like the interior postero-marginals, the latter 44 μ. Legs slender, fore femora very little enlarged, *fore tarsi unarmed.* Pterothorax comparatively slender, 277(250), wings length 640-657, slender, and therefore little narrowed at middle, fringe hairs comparatively sparingly set, 5-7 fringe cilia duplicated (in 20 cases), in one case 8. Basal wing bristles strongly knobbed, 32-38, 36-44 and 48-58 μ. Tergites VII and VIII with two pairs of median microsetae, pores on VII very closely approximated.

Bristles at sides of abdomen long, hyaline, b. 1 on VII knobbed, 84-89 μ, b. 2 hair-like, pointed, 105 μ; on segment VIII, b. 1 : 64, b. 2 : 84-87, both knobbed, IX segment, b.1 112-116, knobbed, b.2 : 120-130, b.1a : 28 μ. Tube conical, 112 (dorsally 104) in length and 58 and (at apex) 32 μ in width. Longest anal setae, 145 μ.

Male : A weak male fully agrees with the female, a tarsal tooth is scarcely indicated, but may be present in oedymerous specimens. Measurements of allotype : Head, length (width) 146(137-140), eyes lateral diameter 63, cheeks behind eyes 90. Postoculars 48. Antennal joints, lengths (breadths) : 31-34 (base 27, apex 22), 39(24), 36-38(22), 45(25), 42(20), 39(20), 36(18), 37(11). Prothorax, length (width without coxae) 96(188); antero-angulars 20-25, laterals 28, epimerals 36, postero-marginals 32. Pterothorax, length (width) 234(208). Wings, length 536, basal bristles 38, 30 and 38-40. Double fringe 4. Bristles 1 on segment IX 92, b. 1a : 24-28, b. 2 (stout) 28-30, b. 3 : 108-112, all pointed. Tube, length (width) 100(50-52 : 31). Anal setae about 120.

Habitat : Sudan, Galaa-el-Nakhl, Kassala Prov., on *Acalypha* (?) spec., leg. Dafaalla (No. 218); ibidem, 5.x.1930, on *Solanum* sp., leg. W.P.L. Cameron (No. 215); male, ibidem, x.1930, in flower of ***Abutilon*** spec., leg. W.P.L. Cameron (No. 227); females, *Senegal*, Bambey, leg. J. Risbec (labelled : *H. tritici* ?), ex coll. Brit. Museum.

This species, very likely a grass insect, is easily recognizeable by the elongate, parallel-sided head and elongate pterothorax, the distinctly knobbed, pale bristles, the very slender wings having sparingly set fringe cilia, very closely approximated pores on tergite VII, short tube, but long bristles on tergite IX. It seems to come closest to *sorghicola* Bagn., unknown to me, but the latter is, as the measurements of the unique type (given by Bagnall) show, a much larger insect, having wholly dark tibiae.

Haplothrips gallarum spec. nov.

Female : Blackish brown, with light crimson body pigment. Legs dark, middle and hind tarsi yellow-grey, fore tibiae pale yellow, at base and margins darkened. Antennae with joints 1, 2, 7 and 8 wholly dark, 3 pale yellow, slightly grey at extreme apex, 4, 5 and 6 pale grey, basal half or third of 4 and 5 and sometimes base of 6 yellow. Wings hyaline, scale and short basal plate darkened. All major bristles, except the slightly shaded prothoracics and the distinctly shaded anals, hyaline.

Head, length (width) 192 (about 172), lateral diameter of eye 65, cheeks behind eyes 128-132. Postoculars well developed, 44-52, knobbed. Mouthcone narrowly rounded. Antennae comparatively rather long; measurements of joints (of holotype), in μ : 18-20 (base 29, apex 25), 42(26),

42-43(25), 48(30), 45(27), 42(24), 38(20), 25(12). Antennal 3 with *two* sense-cones, the rest with the normal number. Antennal 7 constricted at base, 4-6 shortly pedicellate, 8 shortly conical, not narrowed at base, but somewhat narrower than 7 at apex. Prothorax short, length 100, width (somewhat pressed) 188; antero-angular, as all other prothoracic bristles, knobbed, 32-36, interior antero-marginals 28, epimerals 56-60, interior postero-marginals and coxals 32-36 μ. Fore tarsi with *very minute* tooth. Pterothorax, length (width) 295(310-320). Wings, length about 796 μ, moderately broad, strongly narrowed at middle, fringe smooth; basal bristles 1, 2: 40-49, b.3: 56-58 μ. Double fringe 8-10. Pores on tergite VII not very closely approximated, on VII and VIII two pairs of median micro-setae present. Lateral bristles of segment VII pointed, 76 and 95, on segment VIII, b.1 nearly blunt, 52-53, b.2 pointed, 81-92. B.1 of segment IX nearly pointed, 88-92, b.2 : 100. Tube, length 108 (dorsally 96), width at base 58, at apex 32 μ, shape shortly conical. Longest anal setae 120 μ.

M a l e : Antennae somewhat darker, even joint 3 slightly shaded at apex, 4-6 pale only at base. Middle and hind tarsi grey. Fore tarsi with tooth. Double fringe : 7-9. There occurs a symmetrical monstrum having 7-segmented antennae. Measurements (of allotype), in μ : Head, length (width) 188(156-160), eyes, lateral diameter 62, cheeks behind eyes 132, postoculars 45. Antennal joints, lengths (breadths) : 20(base 27, apex 24), 42(24), 43-45(24), 49-50(28), 46-48(24), 42(22), 42(18), 27(13). Prothorax, length (width) 100 (232); antero-angular bristles 28, epimerals 52, interior postero-marginals 40. Pterothorax, length (width) 268(295). Wings, length 780, basal wing bristles 36, 38, 52-56. B.1 on segment IX : 100, b.2 : 28, b.3 well 110. Tube, length 120 (dorsally 112), width at base 50, at apex 28. Longest anal setae 120 μ. The pseudovirga, though not well exserted, shows its slender shape, only 6 μ broad, and that it is neither widened nor narrowed towards tip, the latter being narrowly rounded.

H a b i t a t : Morocco, Ksar-el-Souk, xi.1936, in galls on *Tamarix articulata* (leg. J o u r d a n). Probably inquiline (hibernating).

This species is most similar to *salloumensis*, which, by the way, is not a variety of *acanthoscelis*, but a proper species. The new species is distinguished from the former by the shape of the aedeagus of the male, which, in *salloumensis*, is distinctly widened apically, i.e. lanceolate as a whole, while it is evenly wide to tip in *gallarum*. The females are not easily separable: in *salloumensis*, the tarsal tooth is distinctly developed. In *limoniastri*, joint 7 of antennae is distinctly pedicellate at base, in *gallarum* constricted only; in *gallarum*, only joints 1, 2, 7 and 8 are as dark as the head, all the rest paler, in *salloumensis*, the intermediate antennal joints are more strongly darkened.

Haplothrips amygdali spec. nov.

Female: Dark brown with rather profusely developed crimson body pigment. All major bristles (inclusive of basal wing bristles) *dark*. Fore and middle femora dark as the body, *hind femora lighter*, yellow-grey, but darker than the *pale yellow tibiae* and tarsi. Antennal joints 1 and 8 of about the same colour as the hind femora, 7 pale yellow brown, i.e. only slightly shaded, joints 2-6 pale yellow, 2 scarcely shaded at extreme base. Fore wings slightly shaded in basal half, the whole basal plate and scale quite dark.

Head, length (width) 166(172), about as long as broad, cheeks slightly arched, lateral diameter of eye 68-72 μ. Mouth-cone narrowly rounded. Postocular bristles 54-56, with white knob as nearly all major body bristles. Lengths (breadths) of antennal joints : 20 (base 29, apex 21), 48(25), 44-46(21), 52(26), 48(22), 44(21), 36(18), 25(11) μ; total length of antennae : 317-320 μ. Antennae similar as in *subtilissimus*, joint 1 short, narrowed towards apex, 3 slender, interior margin straight, 4 longer than 3; 5 and 6 slightly obliquely truncate at apex, 8 shortly conical, not distinctly narrowed at base; sense-cones : 3 with $0+1$, 4 with $2+2$, 5 and 6 with $1+1^{+1}$, 7 with 1 (dorsal). Pronotum, length about 105, width 232 (with coxae about 245); antero-angular bristles 45 μ, *interior antero-marginals vestigial;* at most one pair of discal micro-setae present; lateral bristles small, 12-20 μ, epimerals 60, interior postero-marginals 45 μ. Pterothorax, length 277, width 303-312 μ. Metanotum not reticulate. Fore femora slightly stouter than middle and hind femora, fore tarsi unarmed. Wings, length 745, narrow, slightly narrowed in the middle, basal wing bristles, 1, 2: 40-45, b.3: 72, b.1, 2 knobbed, b.3 not quite sharp; fringe smooth, double fringe 9. Bristle 1 of sides of abdomen (beside wing retaining spine) long, on VI and VII about 87 μ, on VIII b.1 40-45; b.2 (ventral) on segment VI: 48, on VII: 60, on VIII: 72-75; bristles 1 and 2 on IX: 73(b.1a 20-25), b.3: somewhat longer than 1 or 2. Pores on VI and VII very closely approximated, much distant on VIII; one pair of micro-setae present on each of the above tergites.

Habitat: Palestine, Kirjat Anawim, 28.i.1935, on *Prunus amygdalus*, leg. Bodenheimer.

A remarkable species that I ventured to describe after a unique specimen. The practical absence of the interior antero-marginal prothoracic bristles shows it to be closely allied with *minutus* and *knechteli*. The pale hind legs (inclusive of femora) are distinctive; in *knechteli* and *minutus*, moreover, bristle 3 of wing base is knobbed, b.1 of segment IX of abdomen blunt, and the antennae are less slender; *minutus* is further distinguished by the dark bases of the middle and hind tibiae.

Haplothrips siwanus spec. nov.

A small species.

F e m a l e : Black or blackish brown, with crimson mesodermal pigmentation. Legs with fore tibiae pale yellow, darkened only at base and at exterior margins, all tarsi pale yellow, middle and hind tibiae about 28-32 μ, pale yellow at apices, these yellow parts distinctly longer than in *maroccanus*. Postocular and prothoracic bristles dark, with white knobs, basal wing bristles and abdominal bristles hyaline, anal setae darkened. Antennae with joints 1, 2, 7 and 8 dark, 2 pale at extreme apex, all other joints pale yellow, 4 and 5 mostly at apices, 6 in apical half, very pale greyish.

Habitus of *cahirensis*.

Head of h o l o t y p e 176(160), lateral eye diameter 68, length of cheeks behind eyes 108-112 μ. Postoculars well developed, 32-36 μ. Mouth-cone very narrowly rounded. Antennal joint 1 narrowed towards apex, 3 slender, sides straight, widened towards apex, 4 much broader, 8 broad at base; joint 3 with 0+1, 4 with 2+2, 5 and 6 with $1+1^{+1}$, 7 with 1 (dorsal), sense-cone. Lengths (breadths) of joints in μ : 20(base 29-31, apex 22), 45(26), 45(22), 50(27), 45(24), 41-42(22), 39(17), 22(11-12). Prothorax, length (width without coxae) 100-105(220) μ. Both pairs of antero-marginal bristles well developed, interiors 22-26, angulars 26-32 μ, laterals somewhat longer, epimerals 48-56, interiors 40-44 μ, straight, knobbed; disc with only one pair of micro-setae behind fore margin. Fore femora simple, fore tarsi unarmed. Pterothorax about as long as wide, 277-330 μ. Wings, length about 657, narrow, basally only shaded at the scale, fringe moderately dense, with 8-11 cilia duplicated. Basal wing bristles 36, 36 and 52-56 μ, all knobbed. Bristles at sides of abdomen, b.1 slightly knobbed, 80-85, b.2 pointed, 76-80; b.1, 2 on VIII : 52 and 72, respectively, blunt. Bristles on IX nearly pointed, 1, 2 : 76-84 μ. Pores on tergite VII approximated, on VIII widely separated, both segments with only one pair of median micro-setae. Tube, length 100 (dorsally 92), width at base 48, at apex 29; anal setae, length 108 μ.

M a l e : Fore tarsi with weak tooth, fore legs slender. Antennae slenderer than in the female, double fringe the same. Pseudovirga very similar to that of *cahirensis* (Plate, fig. 4), but not exactly the same (Plate, fig. 5). Measurements (of a l l o t y p e), in μ : Head, length 172, width 160-165, eyes (lateral diameter) 72, length of cheeks behind eyes 108. Postocular bristles 32, antero-marginal prothoracics 24, epimerals 48, interior postero-marginals 33. Basal wing bristles 32, 32-36, 40. B.1 on segment IX not quite sharply pointed, 84-88, b.2 (spine) 40, b.3, pointed, 108. Tube, length (width) 100 (48 : 28). Longest anal setae, length 105 μ.

H a b i t a t : Several females, two males, Egypt, Oasis Siwa, 14 and 15.iv.1938, in flowers of *Olea europaea* (leg. M o h a m e d H u s s e i n).

This species comes in the group of *cahirensis* : Fore tarsal tooth wanting, interior antero-marginal bristles of pronotum well developed, all prothoracic bristles dark, with white knobs, basal wing bristles *pale*, abdominal bristles pale. The constantly abruptly yellow apices of the middle and hind tibiae easily separate this species from *cahirensis*; thus it comes closest to *rabinovitchi* and *maroccanus*; in the former species, however, the middle tibiae are more extensively yellow, namely for the whole distal half, and joint 7 of the antennae is pale at base, pronotal bristles are shorter, and the basal wing bristles much shorter. In *maroccanus*, the tips of the tibiae are more narrowly yellow, and the antennae are more elongate, a character that also agrees with *rabinovitchi*.

Haplothrips globiceps (Bagnall)

Syn.: *Hapliothrips globiceps* Bagnall (*Ann. Mag. Nat. Hist.* (10), 14, p. 496).

This species is not generically different from *Haplothrips*, for it comes very close to *H. minutus* and *knechteli*. From the latter species it differs in having finer, nearly pointed postocular and midlateral prothoracic bristles; the epimeral bristles are slightly blunt. Bristle 3 of basal wing bristles sharply pointed, b.1 and 2, or at least b.1, somewhat blunt. Antennal 3 with exterior sense-cone only developed; joint 2 yellow, dark at base or in basal half, base of joint 7 yellow or paler than the rest. All tibiae pale yellow, except their extreme bases which are dark. Cheeks slightly rounded, about as in *minutus* and *knechteli*.

Some measurements of holotype (Smyrna, 25.vi.1913, on *Vitis vinifera*) : Head, length from eyes 178, width 184 μ. Antennal joints from joint 2 : 49(27), 50(25), 56(30), 50(25), 46-48(23), 38(20), 24-25(11) μ.

Haplothrips salvadorae spec. nov.

Female : Blackish brown or black, with profusely developed crimson mesodermal pigment. Femora and tibiae having the colour of the head, middle and hind tibiae abruptly yellow (for about 24-28 μ) at apices; fore tibiae 1/3 to 2/3 of their length pale yellow, tarsi pale yellow. Joints 1 and 2 of antennae dark, but 2 mostly pale yellow in apical half, in rare cases darker; joints 3 to 6 pale yellow, rarely (in immature specimens) joints 4 to 6 slightly greyish at apices. Postocular and prothoracic bristles dark with white heads. Basal wing and abdominal bristles hyaline, anal setae shaded with grey. Wings hyaline, even at base (scale) only slightly infumated.

Head elongate, length 200, width 163 μ, lateral diameter of eyes 66-72, cheeks' length behind eyes 128-132 μ. Postoculars about 40 μ. Lengths (breadths) of antennal joints : 20-22 (base 29, apex 23), 45(25), 45-46(21)

50-52(26), 45-46(24), 42(22), 34(17), 24(11) μ. Sense-cones as in *cahirensis*, and shape of antennae the same. Prothorax, length (width) 64(220), antero-angular bristles 36-40, interiors 32-34, interior postero-marginals 45, epimerals 52-56. Fore femora simple, fore tarsi without tooth. Pterothorax, length (width) 277-286(277), wings length 745 μ. Wings as in *cahirensis* or *maroccannus*, basal bristles 40-45, 38-42 and 62-65 μ; 7-13 cilia duplicated. Micro-pores on tergite VIII widely separated, on VII very closely approximated; two micro-setae only present on each segment. Bristles on segment IX: b.1, 68-72; b.2, 80 μ. Tube short, conical, length 100 (dorsally 96), width at base 50, at apex 28 μ. Longest anal setae measuring 112-116 μ.

Male: Weaker, but otherwise fully agreeing with the female. Middle and hind tibiae pale yellow at apices for a length of about 40 μ. Fore tarsi toothed, antennae slenderer. Pseudovirga constricted before apex, produced at tip into two small teeth.

Habitat: Females, male, Hedjas, Wadi Qalah, 9.i.1937, on leaves of *Salvadora persica* (leg. Mohamed Kassim).

This fine little species comes close to *cahirensis* —which occasionally may also occur on *Salvadora* — but, owing to the yellow tips of the tibiae, it is more similar to *maroccanus*; it is smaller, on an average, the antennae are paler than in the latter species (*maroccanus*), the tibiae distinctly more broadly pale yellow at apices, and the postocular and prothoracic bristles are comparatively longer. The most striking difference, however, lies in the shape of the pseudovirga of the aedeagus.

Haplothrips constrictus spec. nov.

Female: Blackish brown, legs dark, fore tibiae little paler at apex, fore tarsi yellow-grey. Antennal joints 1 and 2 dark, 3 to 7 yellow, 7 sometimes more or less infuscated, 8 dark. Wings hyaline, major body bristles light.

Head elongate, broadest about middle of sides, length 232, width 200 μ, cheeks evenly and slightly convex, lateral diameter of eyes 80-85 μ; hind ocelli somewhat anterior to middle of eyes; postocular bristles small, perhaps 36 μ, pointed. Mouth-cone short, broadly rounded, truncate. Antennae very moderately long, joint 1 much narrowed towards apex, 3 strongly convex interiorly, with only 1 sense-cone, 4 with three, 5 and 6 each with two, 7 with one (dorsal). Lengths (breadths) of antennal joints, in μ: 17(base 32, apex 25), 48-50(28), 39-42(24), 45(29), 45(28), 42(25), 42(20), 28(13). Prothorax, length 180-185, width without coxae about 277 μ; interior antero-marginal bristles vestigial, antero-angulars 24-28 μ, small. Both postero-angular bristles (including one epimeral) short, 40 μ at the most, pointed; disk of pronotum behind fore margin with only one pair of microsetae. Fore

femora *slightly* incrassate, fore tibiae short (120 : 52 μ), fore tarsi with *very small* tooth. Pterothorax, length 363, width 320 μ. Wings moderately broad, fringe smooth, only 6 cilia doubled; basal wing bristles short, 24, 32 and 36-40 μ, pointed. Middle and hind legs stout, tarsi stout. Abdomen with tergite VII having two to three pairs, *tergite VIII having 6 pairs of microsetae*, pores comparatively well separated. Rod within segment IX long. Bristles on segment IX fine, pointed, b.1 and 2 about 120 μ in length. Tube of characteristical shape, shortly conical as a whole, *strongly constricted beyond base*, constricted part with fine and dense cross-lines, remaining portion finely and densely longitudinally striated, length 140, width at base 72 μ. (Anal hairs broken off).

Habitat: Belgian Congo, Mayya Moto, 950 m., 15.xi.1934, leg. G.F. de Witte (coll. R. Inst. Sci. Nat. Belge, Brussels).

I know only two specimens of this species, one of them mutilated though showing the same characteristical constriction and structure of the tube I do not know from any other species of this large genus. Otherwise, the species comes nearest to *H. caespitis* Pr. which, however, has normal tube (in all specimens), without the basally transversal, but distally longitudinal, striation, which is peculiar to the new species.

Haplothrips balachowskyi spec. nov.

Female: Black or brownish black, legs dark, middle and hind tarsi yellow-grey, fore tarsi yellow, fore tibiae only paler at apex, not yellow. Antennal joints 1 and 2 black, 3 pale yellow, usually very slightly shaded with grey, 4 and 5 yellowish at base only, 6 not or only indistinctly paler at pedicel. Major body bristles pale, coxal bristle slightly infumated, basal wing bristles hyaline, anal setae shaded basally. Wings hyaline, basal plate dark at base, but not beyond bristle 2.

Head elongate, length (width) 212(184-188), other specimens 204(184), front ocellus somewhat in front of fore margin of eyes, lateral diameter of eye 62-66 μ, cheeks behind eyes 160 μ. Postoculars well developed, 68-72 μ, hyaline, pointed. Mouth-cone broadly rounded. Antennae slender, joint 1 somewhat concave laterally, 3 strongly asymmetrical, slender, with two sense-cones, 4 with 2+2, the following joints as usual; joints 3 to 6 somewhat pedicellate, 7 somewhat constricted at base, and, as usual with basal rim, 8 broad at base. Prothorax short, length (width without coxae) 125(260) μ, both pairs of antero-marginal bristles well developed, the angulars of them 36-40, the interiors 28-32 μ, blunt, epimerals 65-72 μ, interior postero-marginals 44-52 μ, blunt; disc of pronotum behind fore margin with only one pair of micro-setae. Pterothorax, length 345, width 355, wings about 900 μ in length, strongly narrowed at middle, basal bristles

closely approximated, in a triangle, hyaline, 40, 52, 73 μ in length. Fringe hairs smooth, near apex 6-10 cilia duplicated. Tergite VII with one, tergite VIII with two pairs of micro-setae, micro-pores of VII moderately closely approximated. Bristles on abdominal segment IX fine, pointed, b.1, 2 : 88-96 μ. Tube short, conical, 124-128 (dorsally 108-122) in length, basal width 64-66, apical width 35-36. Anal setae, lenght 107-112 μ.

Male : In the oedymerous form, the antennae are very slender, e.g. : 28(28), 48(24), 48(27), 56(29), 48(26), 42(22), 40(20), 28(12) μ. Head, length (width) 200(168), lateral length of eyes 65, cheeks behind them 140 μ. Prothorax, length 128. Pterothorax, width 310. Bristles on segment IX : b.1 : 107, b.2 (spine) 30-32, b.3 : 120 μ. Tube, length 128 (dorsally 120), width at base 56, at apex 32. Pseudovirga slender, scarcely noticeably narrowed in apical third, apex slightly pointed, ductus somewhat surpassing apex.

Habitat : A dozen females and 2 males, Morocco, Ued Asaha 30 km. south Goulimine, 19.iv.1948, in flowers of *Limoniastrum* spec., leg A. Balachowsky (No. 316).

This species comes closest to *eragrostidis*, but it is distinguished not only by the male aedeagus, but also in the female sex by the well developed two sense-cones on joint 3, the broad basal rim of joint 7, the more elongate head, the somewhat fringed or at least obviously blunt basal wing and epimeral bristles, the distinctly shaded joints 4-6, and the greater number of double fringe cilia.

Haplothrips maroccanus spec. (or ssp.) nov.

This form is very similar to *cahirensis*, and it can only be decided if it is a proper species or a variety of *cahirensis*, after a close examination of well mounted aedeagi.

Colour as in *cahirensis*, antennae somewhat darker on an average, for joint 4, 5 and 6 are more or less strongly infumated, 4 being yellow only at basal half, 5 at basal third and 6 at extreme base. It differs at first sight in the colour of the middle and hind tibiae, which are abruptly pale yellow at tips (for a length of 20-25 μ), while *cahirensis*, of which species I was able to examine about 100 specimens, has always wholly dark middle and hind tibiae. Another difference lies in the lengths of the major prothoracic bristles. The largest specimens show the following measurements of these bristles : antero-angulars 32-34, interiors 28-30, epimerals 52-60, interior postero-marginals 40-45 μ; postoculars 32-35 μ. Examples of the same size, of *cahirensis*, have the following bristle lengths : antero-angulars 40, interiors 34, epimerals 65, interior postero-marginals 48-52, postoculars at least 40 μ. Mouth-cone slender, narrowly rounded, as in *cahirensis*. Basal wing bristles about 40, 36, 56, in *cahiriensis* 48, 44, 64-68 μ, in specimens of exactly the same mesothorax width.

Male : The pseudovirga cannot be described exactly owing to its lateral position in the unique specimen, but it is no doubt of the general shape prevalent in *cahirensis*, and quite different from that of *salvadorae*.

Habitat : 6 females, 1 male, Morocco, Ksar-el-Suk, 15.x.1936, in galls of a *Tortricidae* spec. on *Tamarix articulata* (leg. Jourdan).

Haplothrips tolerabilis Pries.

(1936, *Bull. Soc. Roy. Ent. d'Egypte*, p. 96)

A very widely distributed species, common on cereal crops. Originally described after two females from the Sudan (on *Cymbopogon*). Through Dr. A. Balachowsky, I received a good series of this species from Libya, Fezzan (Oasis Rhat, 1.iv.1949) from cultivated barley (*Hordeum*) and from the grass *Imperata cylindrica*. Moh. Kassim brought me specimens from Hedjas, Medina (6.ii.1937) that he collected from maize (*Zea mays*), and from Yemen, Taiz (iv.1937) taken from millet (*Sorghum*). The species is supposed to occur in Upper Egypt, too, but has up to the present escaped discovery.

To the description given by me (l.c.) I may add that in the female an extremely small tarsal tooth may be seen in certain aspect, and that the measurements of the body may be greater than indicated in the original description, the antennae somewhat more elongate. Postocular and prothoracic bristles are pale, straight, knobbed, the interior antero-angular bristles are always well developed. The pterothorax is usually somewhat longer than broad. Double fringe cilia 5-8 only. It belongs to the group of species having very slender wings with very slight narrowing at middle and with cilia not very closely inserted.

Male : Pseudovirga slender, bluntly triangular at tip, and with slight constriction before apex (Plate, fig. 6).

NEW RECORDS

(Species in alphabetical order)

H. alexandrinus Pr. (Plate, fig. 7). — Egypt, Montaza, 1.iii.1939, on *Senecio coronopifolius* ; Serw (Lake Menzala), 20.iii.1949, on *Chrysanthemum coronarium* (cultivated).

H. andresi Pr. — Salloum, iv, on *Plantago ovata* (leg. M. Hussein) and iii, on *Retama* ; Matrouh, iv, on *Crucianella maritima* (leg. M. Hussein) ; Borg-el-Arab, iii, on *Atriplex parviflorum* (leg. Priesner) ; Sinai, Wadi Gederât, v., on *Juncus* and in flowers of *Nitraria retusa* (leg. Priesner) ; Kattara, iv, with larvae in flowers of *Thymelaea hirsuta*.

H. cahirensis (Tryb.) (Fig. 4). — Cairo-Dokki, ix, on leaf of *Ricinus communis*, together with *Scolothrips* spp. and *Anychus orientalis* (Red

Spider); ibidem, xi, on cotton; ibidem, x, in leaf galls of *Gynaikothrips ficorum* (March.); Giza, xi, in flowers of *Sapota achras* (larvae); Meadi, v, on apricot fruit; Suez, iii, on leaves of *Pyrus malus*, feeding on *Tenuipalpus* spec. leg T. Sayed; Sinai, Wadi Abu Tog, iii, on *Retama raetam*, leg. Wittmer; Kosseir, Wadi Ambaga, 13.iii.1938, on *Zygophyllum coccineum* in bloom, leg. M. Tewfik; Gebel Elba, ii and iii, common on *Lycium arabicum*, leg. Priesner.

H. cerealis Pr. — Palestine, El-Tor, 30.iii.1936, on wheat (leg. E. Rivnay).

H. chrysanthemi Pr. — Sidi Barrani, iv, on *Salvia lanigera* (leg. Moh. Hussein); Dabaa, iv, on *Statice tubiflora* (leg. Moh. Hussein); Meadi, ii, in flowers of *Zilla spinosa* (leg. Priesner).

H. clarisetis Pr. — Sahara (central), Tin Tardjeli, 1900 m., 22.iv.1949, on *Salsolaceae* spec. (leg. A. Balachowsky); Sinai, El-Areesh, iv., swept from *Cynodon dactylon*; Wadi Gederât, iv, in flowers of *Nitraria retusa* (leg. Priesner).

H. distinguendus (Uz.). — Palestine, Ein Harod, 19.ii.1936, on *Anthemis*; Benjamina, 24.iii.1936; Kfar Gileadi, 9.iv.1936, in flower of *Scabiosa* spec. (leg. E. Rivnay).

H. eragrostidis Pr. — Egypt, Cairo, x, larvae in cob of *Sorghum*; Giza, v, in flowers of *Vitex agnus-castus*; Meadi, x, with larvae in ears of *Polypogon monspeliensis*; Wadi Hoff, iii, on *Zilla spinosa*; Kom Ombo, iii, on *Aristida pungens*; Oasis Kharga, III, on *Gramineae*, all stages; leg. Priesner; Siwa, iv, on *Gramineae*; Baharia, iv, on *Panicum* and *Imperata cylindrica*, leg. Moh. Hussein.

H. flavicinctus (Karny). — Egypt, Meadi, x, Faroukia, iii. on grasses; Sinai, Wadi Gederât, v, on *Juncus* (leg. Priesner).

H. giganteus Pr. — Egypt, Matrouh and Kattara, iii-iv, with larvae (1st instar), on *Cistanche lutea* (leg. Moh. Hussein); Sinai, Wadi Gederât, 9.iv.1937, in flowers of *Cistanche lutea* (leg. Priesner); Morocco, Plage de Foum, Asaka, 20.iv.1948, on *Orobanche* spec. (leg. Balachowsky).

H. gowdeyi (Frkl.). — Egypt, Montaza, 7.ix.1937, in heads of *Sorghum vulgare*, and ears of *Polypogon monspeliensis*; Bahtim, xii, *Inula crithmoides*; Serw (Menzala), x, in flowers of *Kochia trichophylla*; Meadi, 26.x.1937, in ears of *Polypogon monspeliensis*; Palestine, 14.ii.1938, on *Agathea* and *Verbena hybrida*; 17.ii.1938, in flowers of *Bignonia*; 8.iii.1936, on *Polypogon monspeliensis*; 20.ii.1938, in flowers of *Lantana camara* and *L. delicatissima*.

H. hispanicus Pr. — Palestine, 18.i.1938, in flower of *Senecio vernalis*.

H. husseini Pr. — Egypt, Gebel Elba, in flowers of *Compositae* spec.

(leg. Moh. Hussein). Central Sahara, Dider, 1450 m., 24.iv.1949, in flowers of *Asteriscus graveolens* (leg. A. Balachowsky).

H. jordanicus Pr. (Plate, fig. 8). — Palestine, Kali Roy, 8.iv.1936, on *Erigeron bovei* (leg. E. Rivnay).

H. leptadeniae Pr. — Egypt, Red Sea Coast (Shalateen); Gebel Elba, 1939, in flowers of *Leptadenia pyrotechnica* (leg. Moh. Hussein); Hedjas, Wadi-el-Khabbar, i, on *Leptadenia;* Medina, ii (accidentally) on *Zea mays* (leg. M. Kassim).

H. limoniastri (Plate, fig. 9). — Egypt, Salloum, iv, in flowers of *Picris coronopifolia* and *Frankenia laevis* (leg. M. Kassim); Matrouh, iv, in flowers of *Crucianella maritima* (leg. Moh. Hussein); Dabaa, iv, in flowers of *Statice tubiflora* (leg. Moh. Hussein).

H. ochradeni Pr. — Egypt, Wadi Hoff, iii. in galls of *Ceutorrhynchus* spec. on *Ochradenus baccatus* (leg. Priesner); Wadi Rish-Rash, iv (leg. Farag).

H. odontospermi Pr. — Egypt, Wadi Rish-Rash, iv; North Galala, ii (leg. Farag).

H. palaestinensis Pr. — Palestine, ii-iv.1936, in flowers of *Allium, Anthemis, Armenis mixta, Kaeleria cristata, Linaria, Senecio vernalis* (leg. E. Rivnay).

H. pharao Pr. — Egypt, Gebel Elba, iii, on *Panicum turgidum* (stray specimens ii, on *Aerva tometosa*), leg. Priesner; Hedjas, Mellaha, 12.i. 1937, and Rabegh, 8.v.1937, on *Panicum turgidum;* Yemen, 11.iii.1937, on *Panicum turgidum* (leg. Moh. Kassim).

H. rabinovitchi Pr. — Palestine, Nezli, 22.ii.1938, in flower of *Prunus amygdalus;* Rehoboth, 20.iii.1938, in flowers of *Dimorphotheca* spec. and *Mangifera indica* (leg. E. Rivnay).

H. reuteri (Karny). — Egypt, Kattara, iv, on *Cistanche lutea;* Sinai, El-Areesh, v; Tor, Wadi Isla, ii; Kosseima (leg. Priesner and Wittmer); Kosseir, Wadi Ambaga, xii, on *Tamarix*, and Shalateen (leg. Moh. Hussein); Yemen, Sanaa, iv, on *Pulicaria* (Moh. Kassim).

H. rivnayi Pr. — Palestine, Nahariam, 19.iv.1936, on *Linum* spec.; Kali Roy, 8.iv.1936, on *Erigeron bovei* (leg. E. Rivnay).

H. salloumensis Pr. (Plate, fig. 10). — Egypt, Borg-el-Arab, 25.iii.1935 and 17.v.1949, in flowers of *Atriplex parvifolium;* Meadi, 20.ii.1939, in flowers of *Zilla spinosa* (leg. Priesner).

H. sorghi Bagn. — Sudan, Wad Medani, 22.vii.1927, in twig galls of *Zizyphus spina-christi*, 1.ix.1927, on *Medicago sativa;* Tajiba, 17.x.1927, on flower buds of cotton (leg. W.P.L. Cameron).

H. talpa Pr. — Egypt, Wàdi Hoff, iv, on *Odontospermum graveolens;* Salloum, iv, on *Plantago ovata;* Baharia oasis. iv. on *Panicum.* — Libya,

Fezzan, 8.iii.1949, on *Imperata cylindrica;* ibidem, Oasis Rhat, 1.iv.1949, on *Hordeum* (cultivated). Actual host plant as yet unknown.

H. tamaricinus Pr. — Egypt, Oasis Siwa, iii and ix, in flowers of *Tamarix* (leg. Moh. Hussein).

H. tardus Pr. — Egypt, Alexandria, on *Croton* (accidental); Helwan, ii, under fallen leaves (leg. H. Priesner); Wadi Rish-Rash, iv.1938 (leg. Farag). — Libya, Fezzan, El-Barkat, 5.iv.1949, in flowers of *Pulicaria crispa* (leg. A. Balachowsky). — Hedjas, Sabq, 14.i.1937, in flowers of *Pulicaria* spec. — Yemen, Zohra, 16.ii.1937, in flowers of *Pulicaria* spec.; ibidem, Sanaa, 13.iv.1937, in flowers of *Pulicaria* spec. (leg. Moh. Kassim).

H. tritici (Kurdjum.) (Plate, fig. 11). — Italy, Lucca, v.1938, on wheat (leg. A. Melis). — Syria, Damascus, 14.iv.1935 (W. Wittmer leg.). — Palestine, El-Tor, and Beit Kerem, 30.iii.1936, on wheat and *Linum mucronatum;* Benjamina, 24.iii.1936, on wheat (leg. E. Rivnay).

Haplothrips Serv.

Key for the subgenera and some closely genera

1 (8) Antennal joint 3 symmetrical.

2 (5) Fore femora distinctly incrassate also in the female.

3 (4) Anal setae not twice as long as tube. Tooth of fore tarsi, if developed at all, less distinctly directed forward. Antennal joint 8 constricted at base .... **cf. Genus Xylaplothrips Pr.**

4 (3) Anal setae at least twice as long as tube. Tooth of fore tarsi well distad, and obliquely directed forward. Antennal 8 broad at base .... **cf. Genus Watsoniella Karny (Karnyothrips Watson)**

5 (2) Fore femora not incrassate.

6 (7) Mouth-cone broadly rounded. Antennal 3 with at most one very small sense-cone. The black antennae more than twice as long as head. Wings reduced or wanting .... **cf. Genus Pezidothrips Pr. (typ. gen. Haplothrips robiniae Pr.)**

7 (6) Mouth-cone pointed. Antennal 3 with 2 or 3 sense-cones. Wings always fully developed .... **cf. 9; cf. Genus Neoheegeria Schm.**

8 (1) Antennal 3 more or less assymmetrical.

9(12) Antennal joint 3 with three conspicuous sense-cones.

10(11) Mouth-cone rounded. Wings very broad, with fringe hairs very closely inserted, hyaline. .... **Subgenus Gigaplothrips Pr.**

11(10) Mouth-cone pointed. .... **cf. Genus Neoheegeria Schm.**

12 (9) Antennal 3 with 0 to 2 sense-cones.

12a(23) Antennal 3 with one or two sense-cones.

13(18) Fore femora with apical margin somewhat raised, exteriorly, about as in *Chirothrips*.

14(15) Prothoracic bristles much dilated, short, infundibuliform, hyaline. Antennal 4 with four sense-cones. Double fringe present. Head normal. .... **cf. Genus Aulothrips nov.**

15(14) Prothoracic bristles normal, not fan-shaped.

16(17) Antennal joint 4 with four sense-cones. Double fringe wanting. Head very short, broader than long, cheeks converging anteriorly .... **cf. Genus Euryaplothrips Ram. and Marg.**

17(16) Antennal joint 4 with only two sense-cones. Head elongate .... **cf. Genus Chiraplothrips Pr.**

18(13) Fore femora normal. Antennal 4 with four sense-cones.

19(20) Wings with double fringe, if reduced, antennae not exceptionally short and stout. .... **Subgenus Haplothrips s.str.** (1)

20(19) Wings without double fringe, or reduced, in this case antennae very short and stout.

21(22) Wings reduced, antennae short and stout, body bristles strongly knobbed. .... **(Subgenus Chonothrips John)** (2)

22(21) Wings normal, seldom reduced, in the latter case antennae normal. .... **Subgenus Trybomiella Bagn.**

23(12a) Antennal 3 without sense-cones.

24(25) Fore wings of macropterous form without double fringe. Joints 6-8 of antennae firmly united by the broad bases of 7 and 8. .... **Subgenus Anchylothrips Hood**

25(24) Fore wings with double fringe. Joints 6-8 normal. .... **cf. Subgenus Haplothrips s.str.**

Subgenus Tryboniella Bagnall

1(12) Fringe cilia about apex of wing roughened or distinctly plumose.

2 (3) Antennal joint 6 longer than 5 .... **trybo nianus Pr. (=bagnalli pallicornis Tryb.)**

3 (2) Antennal 5 somewhat longer than 6, if both of equal length, antennae black.

4 (5) Interior postero-angular bristles and antero-angulars well developed. Disc of pronotum behind fore margin with about three pairs of micro-

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(1) The former subgenera *Zygothrips* Uz. and *Hindsiana* Karny are synonyms of subgenus *Haplothrips* s.str.

(2) *Chonothrips crassicornis* John, the type of this subgenus, is very similar to *Haplothrips minutus;* I do not think this subgenus can be maintained upon the only differences : somewhat stouter antennae, and the presence of a small tarsal tooth.

setae. Tube short. Fringe nearly smooth. Pseudovirga of male spoon-shaped apically, bilobed, lobes rounded. .... **cf. bagnalli (Tryb.)**

5 (4) Interior postero-angular and antero-marginal bristles minute Fringe distinctly plumose or at least roughened.

6 (7) Epimeral pronotal bristles long, much curved near tip, *pointed*. Cheeks with small spines. Sides of tube more straight. .... **wourambulchii Moult.**

7 (6) Epimeral bristles rather long, hyaline, *blunt*.

8(11) Cilia of wings closely set.

9(10) Antennal joint 3 more elongate, usually 52(28) μ. Pseudovirga of male distinctly fish-tail-shaped at apex. .... **nigricornis Bagn.**

10 (9) Antennal 3 less elongate, 40(26) μ. Pseudovirga of male at first constricted then widened before apex, the latter bilobed, lobes rounded, not strongly divergent. .... **tardus Pr.**

11 (8) Cilia comparatively few and not closely set. .... **unicolor Bagn.**

12 (1) Fringe cilia smooth. Interior postero-angular prothoracic bristles well developed (³).

13(14) Antennal joint 3 with only *one* sense-cone. Head large, slender. Pterothorax distinctly longer than broad, elongate. Basal wing bristles closely approximated. Antennae stout, short. .... **talpa Pr.**

14(13) Antennal 3 with *two* sense-cones.

15(16) Extreme apices of middle and hind tibiae pale yellow. Slender species having slender antennae, and joints 3 to 6 for the greater part pale yellow. Pseudovirga with somewhat transverse, small pin-head. .... **mordvilkoi John**

16(15) Middle and hind tibiae wholly dark.

17(18) At least joint 3 to 6 of antennae pale yellow. Joint 3 and apical joints of antennae very short. .... **jordanicus Pr.**

18(17) At least joints 4 to 6 partly darkened, in cases of doubt terminal antennal joints elongate.

19(20) Legs very slender, hind tarsi 3.6 to 4 times as long as wide. Basal wing bristles situated in a triangle. Fore tarsi of female unarmed. Tube very short. Pseudovirga very slender, slightly narrowed towards tip, very slightly bifid. .... **clarisetis Pr. (dolichothripoides Bagn.)**

20(19) Tarsi less slender, fore tarsi of female with tooth.

21(22) Head elongate, about 1.3 times as long as wide. Macropterous and (usually) brachypterous. Antennal joint 7 distinctly constricted at base. Pseudovirga more or less distinctly pin-headed, but head not transverse. On *Dianthus caryophyllus*. .... **cottei (Vuill.)**

(³) It is not mentioned in the description of *tertius* Bagn., if this bristle is developed or not.

22(21) Head less elongate, or not longer than broad.

23(24) Head about as long as broad. Tube 110(52) μ. Pseudovirga slender, bifid apically. On *Heliotropium*. .... **heliotropii Pr.**

24(23) Head somewhat longer than broad. Tube somewhat more elongate.

25(26) Antennal joint 3 short, 39-40(32-33) μ. .... **tertius Bagn.**

26(25) Antennal joint 3 somewhat more elongate, at least 1.4 times as long as broad.

27(28) Antennal 3 of female 36(26) to 40(25) μ. Antennals 5 and 6 partly pale. Pseudovirga with apex, though only slightly broader than pedicel, formed like tongs. .... **articulosus Bagn., derisor Pr.**

28(27) Antennal 3 more elongate, 5 and 6 dark. Pseudovirga much broadened apically, bilobed, lobes rounded, not bent inward... **bagnalli (Tryb.)**

Subgenus Haplothrips s.str.

A (B) Fringe about apex of wings distinctly plumose in both saxes (cf. p. 97).

1(12) Bristles on segment IX of abdomen long, somewhat shorter than tube or about as long as tube (*reuteri*-section).

2 (3) Antennal joints 3 to 6 yellow, usually shaded apically, but the shaded part less sharply defined than in *distinguendus* Uz. Interior postero-marginal prothoracic bristle well developed, 64-68 μ, interior antero-marginals very small. .... **hispanicus Pr.**

3 (2) Colour of antennae not like in *distinguendus*. B.2 and 3 of basal wing bristles usually (except in *tenuicornis*) closely approximated, often not in the same line with b.1.

4 (7) Antennae not quite black. Antennals 3 and 4 with sides rather straight, not convex, but abruptly constricted at apex and near base. Double fringe cilia 8-13.

5 (6) Eyes large, lateral diameter 104-120 μ. Head length from eyes 225-240 μ. Fringe cilia roughened or slightly plumose. ... **dianthinus Pr.**

6 (5) Eyes smaller, lateral diameter 68-65 μ. Head length 165-200 μ. Fringe very rough or distinctly plumose. Pseudovirga slightly pin-headed. ... . **reichardti Pr.**

7 (4) Antennae wholly dark; if paler, double fringe hairs less numerous.

8 (9) Wings very broad, measuring distally 175-180 μ, with 9-12 double-fringe cilia. Eyes larger. Pseudovirga sharply pointed, with two small hyaline appendages, at sides before tip, which are situated on the upper side. .... **odontospermi Pr.**

9 (8) Wings less broad, with 8-9 double fringe cilia, at most.

10(11) Basal wing bristles inserted in one line and about 25 μ distant from one another. 3-5 double fringe cilia present. Longest bristle on abdo-

minal segment IX about 120 μ. (Described after one male, pseudovirga not known) .... **tenuicornis Bagn.**

11(10) Basal wing bristles situated in a triangle, b.2 more closely approximated to 3 than to b.1. 5-9 double fringe cilia present. B.1 of segment IX 145-150 μ. Width of wing up to 110 μ, in apical third. Pseudovirga with two small pointed hyaline appendages *at* apex; tip, therefore, bifid. .... **reuteri (Karny) (satanas Bagn., tenuisetosus Bagn.)**

12 (1) Bristles on segment IX short, *much* shorter than tube (*setiger*-section).

13(14) Antennae coloured about as in *distinguendus*, even joint 7 yellow at extreme base. .... **cf. hispanicus Pr.**

14(13) Antennal joints 3-6 not yellow with dark apices, 4 to 6 much darker, though 4 and 5 sometimes pale at base.

15(16) Bristles on prothorax and the postoculars very short. .... **cf. angusticornis Pr.**

16(15) Postocular and prothoracic bristles long.

17(32) Epimeral and basal wing bristles sharply pointed.

18(27) Antennae wholly black, or only joint 3 somewhat paler at base, but not pale yellow.

19(26) Fringe cilia roughened, not very distinctly plumose. Wings clear or nearly so.

20(21) Basal wing bristles moderately long, of about equal length, usually situated in a triangle. Wings hyaline. Joint 3 slender, much elongate. Pseudovirga spoon-shaped. .... **cf. husseini Pr.**

21(20) Basal wing bristles situated nearly in one line. Antennals 3 and 4 normal or 3 strongly convex interiorly.

22(23) Basal wing bristles shorter, less than 55 μ in length. .... **cf. kraussei Pr.**

23(22) Basal wing bristles longer, or males.

24(25) Pseudovirga slightly widened at apex, not broadly spoon-shaped. Basal wing bristles very long. .... **cf. chrysanthemi Pr.**

25(24) Pseudovirga much widened apically, spoon-shaped, split (fig. 2). Basal wing bristles and those on segment IX shorter. Double fringe 0-6. .... **cf. anthemidinus Pr.**

26(19) Fringe hairs distinctly plumose. Wings slightly shaded. Basal wing bristles not longer than 56 μ. Eyes length 73-78 μ (laterally). Pseudovirga not or only slightly widened before tip. **cf. palaestinensis Pr.**

27(18) Antennal joint 3 yellowish, more or less shaded for the greater portion, 4 or even 5 paler at extreme base. Fringe in most cases very distinctly plumose.

28(31) Double fringe cilia 7 on an average (5 to 10).

29(30) Larger species. Epimeral bristles, length 62-70 μ. Distance of postoculars from eyes 16-17 μ. Length of eyes 70 μ. Tube length (width) 130(50) μ. Wings hyaline or slightly shaded. Antennal 4 or even 5 pale at extreme base. Fringe very distinctly plumose. .... **plumociliatus Maltb.**

30(29) Smaller species. Epimeral bristles, length 75-85 μ. Distance of postoculars from eyes, 18-20 μ. Tube length (width) 155(60) μ. Wings hyaline Fringe slightly plumose or roughened. Basal wing bristles in a straight line. .... **kraussei Pr.**

31(28) Double fringe cilia 11 on an average (8-12). Epimeral bristles, length up to 85 μ. Distance of postoculars from eyes 17-20 μ. Tube length (width) 150(60) μ. Eyes length, 87 μ. Wings often slightly shaded. Fringe somewhat roughened to slightly plumose. Pseudovirga about as in *setiger*. .... **palaestinensis Pr.**

32(17) Epimeral and basal wing bristles blunt or rounded at tips, at least b.1 of latter rounded at tip, or slightly knobbed.

33(38) Antennae wholly black. Fringe often distinctly plumose. (4)

34(35) Epimeral bristle 90-105 μ, shaded. Interior postero-marginals of pronotum very small. Only b.1 of basal wing bristles blunt, at least 50 μ. 4-7 double fringe cilia present. Joints 3 and 4 about 53 μ. Bristles on segment IX of abdomen up to 105 μ. Tube length (width) 160(63) μ. Postoculars longer than in *setiger*. Pseudovirga broad, widened before apex and pointed at tip. .... **sedicola Bagn.**

35(34) Epimeral bristles shorter.

36(37) Epimeral bristles 60-80 μ, if longer (♂), double fringe more numerous or antennals 3 and base of 4 partly yellow. Antennals 3 and 4 : 57-58 μ. 6-9 double fringe hairs. Pseudovirga slender, little widened before tip. .... **uzelianus Bagn.**

37(36) Epimerals 60 μ at the most, hyaline. 0-6 double fringe hairs. Eyes length (lateral) 62-65 μ. Pseudovirga (fig. 2) broadly spoon-shaped, split, but both apical parts not broadly rounded at tip, as this is the case in *husseini*. .... **anthemidinus spec. nov.**

38(33) Antennal joint 3 yellowish, more or less strongly darkened apically, 4 paler at least at extreme base. Postoculars not quite sharp in the female. Fringe strongly plumose.

39(40) Epimeral bristle long, 70-80 μ, rounded at tip or slightly knobbed. All three basal wing bristles blunt in both sexes. Postoculars at least

(4) *H. microsetosus* Bagn. comes, according to the description, into this group, but the fringe of the holotype I could examine is not plumose, just roughened.

68 μ. Antennae usually paler. Interior postero-marginal bristle of prothorax 30-50 μ. Pseudovirga as in *setiger*, but pale central portion oval, much shorter. (Fig. 7). .... **alexandrinus Pr.**

40(39) Epimeral and postocular bristles shorter.

41(44) Interior postero-marginal bristles of pronotum minute, only the epimerals well developed.

42(43) Bristles 1 and 2 of segment IX : 60-70 μ. Pale central portion of head of pseudovirga much elongate. .... **setiger Pr.**

43(42) Bristles 1 and 2 of segment IX : 44-64 μ. ... **setiger canariensis Pr.**

44(41) Interior postero-angular bristle of prothorax developed, 24-45 μ. .... **setiger inulae Pr.**

B (A) Fringe about apex of wings smooth, not plumose.

45(294) Females (see p. 110).

46(47) Antennal joint 3 with *three* sense-cones. Very large species with very broad wings and extremely densely set fringe hairs. Tube rather short, conical. On *Orobanchaceae* in North Africa. .... **(Gigaplothrips) giganteus Pr.**

47(46) Antennal joint 3 with two sense-cones at the most.

48(139) Tube long or moderately long, but not so strongly narrowed towards apex as in *aculeatus* F.

49(116) Postocular bristles well developed, often long and distinctly surpassing cheeks.

50(59) Antennal joints 3 to 6 pale yellow basally, rather abruptly darkened in apical portion.

51(54) Major bristles (e.g. postoculars, epimerals and basal wing bristles) blunt. Tube short.

52(53) Major bristles hyaline. Postoculars shorter. .... **cf. limoniastri Pr.**

53(52) Major bristles darkened, very well developed. ..... **cf. senecionis Bagn.**

54(51) Major bristles sharply pointed.

55(58) Bristles shorter, dark. Eyes larger, cheeks shorter.

56(57) Antennae more strongly shaded, two-thirds of joint 4 and more than half of 6 dark. .... **distinguendus Uz.**

57(56) Antennae less strongly shaded, half or less of 4, apical third of 6 shaded. .... **distinguendus v. crassus Karny**

58(55) Bristles longer, pale. Eyes smaller, cheeks longer. .... **lundbladi Pr.**

59(50) Antennal joints 3 to 6 not so abruptly shaded or antennae nearly or wholly dark.

60(85) Major bristles *blunt*, at least basal wing bristles 1 and 2 blunt or knobbed.

61(68) Antennae wholly black, joint 3 only slightly paler brown or grey than the rest, or yellowish at pedicel.

62(67) Length of antero-angular prothoracic bristles at most 30 μ.

63(66) More than 6 double fringe cilia. Wings somewhat shaded in basal half (or more). Antero-angular bristles of prothorax small, but deve loped.

64(65) Length of epimeral bristles 60-65 μ. Cheeks broader than eyes at hind angles, eyes smaller, less rounded, occupying about 1/3 of the lateral length of the head. Length of b.1 of segment IX : 100 μ. (*H. morisoni* Pr. is most likely hemimacropterous form of *statices*). .... **statices Hal., Bagn.**

65(64) Length of epimeral bristles 44-50 μ. Joint 3 yellowish at base, 4 paler at abse. Eyes larger, about one-half the length of cheeks; head at base of eyes not narrower than across cheeks immediately behind. B.1 of segment IX : 65 μ. ....**cf. pannonicus Fábián**

66(63) 0 to 6 double fringe cilia present. Wings clear. Antero-angular prothoracic bristles extremely minute. Eyes : cheeks = 68-76 : 136 μ. Tube 2.3-2.6 times as long as broad, its length 0.8-0.9 the length of the head. Fringe somewhat roughened. Bristles on IX : 68-80 μ. .... **anthemidinus spec. nov.**

67(62) Antero-angulars 40-45 μ. Eyes 76, cheeks behind them 136 μ. .... **maltbaeki Bagn.**

68(61) Antennal joint 3 partly yellow, usually also the following joints paler at base, this sometimes only at the under side of the joints.

69(70) Antennal joint 3 very long and slender, distinctly longer than 4. Bristle 2 on segment IX much shorter than b.1......... **bodenheimeri Pr.**

70(69) Antennal joint 3 usually a little shorter or as long as 4.

71(72) Median dorsal length of tube about 120 μ. Joint 3 of antennae slenderer, with interior margin nearly straight, as long as 4. .... **retamae Enderl.**

72(71) Tube longer, 132-190 μ. Joint 3 usually distinctly convex interiorly, nearly always somewhat transversely rugose at base.

73(78) Antero-angular pronotal bristles shorter, not exceeding a length of 28-32 μ.

74(77) Epimeral bristles longer, 60-76 μ. Wings clear or very slightly shaded.

75(76) Joints 3 and 4 of antennae : 48-50(29-30) and 53-65(32-34) μ, respectively. Tube nearly 0.3 shorter than head. On *Jasione montana*. .... **jasionis spec. nov.**

76(75) Joints 3 and 4 : 50-53(27-28) and 53-56(31) μ, respectively. Tube 0.2-0.23 shorter than head. On *Helianthemum*. ... **helianthemi Oetting.**

77(74) Epimerals shorter, 44-48 μ. Tube 0.2-0.28 shorter than head. Joints 3 and 4 : 54-56(30-31) and 58-60(34-36) μ, respectively. Lateral length of eyes 76 μ. Postoculars 45 μ. Wings shaded in basal half. .... **pannonicus Fábián**

78(73) Antero-angular pronotal bristles longer.

79(84) 8-13 double fringe cilia.

80(81) Eyes large, as in *distinguendus* and *alpester*. Joint 4 : 64-72(36-38) μ. Head narrowed posteriorly, cheeks straight. Bristles pointed, though epimerals not quite sharp. Wings clear. .... **cf. moestus Pr.**

81(80) Eyes normal.

82(83) Terminal antennal joints slender, as in *tritici*. Wings shaded in basal half. Joint 4 broad, 56(68) μ. Antennae coloured as in *distinguendus*. .... **senecionis Bagn.**

83(82) Terminal antennal joints less slender, 7 with convex sides, joint 8 about 32 μ, joint 4 : 56-58(32-34) μ. Wings nearly hyaline. .... **vuilleti Pr.**

84(79) 5-8 double fringe cilia. Terminal antennal joints slender, 7 pedicellate, nearly parallel-sided, at least 40 μ, joint 8 : 40-45 μ. Wings sometimes slightly shaded. .... **tritici Kurdj.**

85(60) Epimeral and basal wing bristles (at least b.2 and 3) sharply pointed.

86(97) Antennae wholly black, 3 somewhat lighter at base, 4 wholly black. Usually large species with long tube.

87(88) Antero-angular prothoracic bristles, length about 40 μ, postero-angulars 120 μ. .... **aethiopiae Moult.**

88(87) These bristles much shorter, or vestigial.

89(92) Very large species, width of mesothorax 415-485 μ.

90(91) Wings strongly infumated for all their length. Bristles on segment IX moderately long. .... **graecus Karny**

91(90) Wings hyaline or only slightly yellowish. Bristles on IX long. .... **biformis Moult.**

92(89) Smaller species. Mesothorax less broad. Fringe of female rugose (of male plumose).

93(96) All major bristles sharply pointed.

94(95) Antennal joint 3 strongly convex interiorly. Central plate of tergite 1 triangular. .... **chrysanthemi Pr.**

95(94) Antennal joint 3 very slender, as in *bodenheimeri*. Central plate of tergite I parallel-sided at middle. .... **husseini Pr.**

96(93) Basal wing bristles blunt, rarely nearly pointed. Double fringe 0-6. .... **cf. anthemidinus spec. nov.**

97(86) Antennae not wolly black, joint 3 partly pale yellow, of the rest at least joint 4 pale at extreme base, or at the under side.

98(99) Very large species, having very long tube (as long as head). Double fringe 15 and more. Tube about 225-230 μ. .... **simplex Buffa**

99(98) Smaller species having fewer double fringe cilia.

100(101) Eyes length (laterally) 104-112 μ. Head distinctly narrowed towards base. Wings clear. .... **moestus Pr.**

101(100) Eyes smaller, 100 μ at the most, in the latter case wings slightly infumated.

102(103) Head slender. Bristles on segment IX long. Joints 5 and 6 somewhat paler at base (cf. *tritici* : 84) .... **ebneri Pr.**

103(102) Head less slender. Joint 6 always wholly dark. Bristles on IX shorter.

104(105) Antero-angular and epimeral pronotal bristles unusually long. Tube nearly as long as head. .... **marrubiicola Bagn.**

105(104) Bristles of normal length.

106(109) Wings distinctly somewhat greyish in basal half (cf. 84).

107(108) Major bristles pointed. Eyes large, head across eyes as broad as across cheeks, the latter somewhat rugose. .... **alpester Pr.**

108(107) Major bristles not sharp. Smaller species having smaller eyes. Length of b.1 of segment IX : 55-60 μ. ...... **cf. pannonicus Fábián**

109(106) Wings hyaline or nearly so.

110(115) Joints 5 and 6 of antennae not abruptly yellow at base.

111(112) Fringe hairs darker, roughened or slightly plumose. Antennal 7 not pedicellate at base. .... **cf. palaestinensis Pr.**

112(111) Fringe hairs paler, smooth.

113(114) Antennal joint 3 longer, 52-56 μ. Prothoracic and basal wing bristles nearly knobbed. .... **cf. tritici Kurdj.**

114(113) Antennal 3 shorter, about 48 μ. Major bristles slightly blunt. .... **cerealis Pr.**

115(110) Joints 5 and 6 abruptly yellow at base. .... **cf. distinguendus Uz.**

116 (49) Postocular bristles very short. Epimeral bristles short or very moderately long.

117(138) Tube 0.7-0.9 the length of head.

118(121) Tube long, 2.8-3.3 (usually 3) times as long as broad at base. Antero- and postero-angular prothoracic bristles vestigial or extremely short.

119(120) Antennal joint 3 (of female) 1.7-1.9 times as long as broad. Antennae less elongate. Joint 4 (or also 5) often with pale spot at base, below. Wings (usually all along, or at least in basal half) strongly infumated. Double fringe hairs 8-12 (seldom 7). Lower

surface of head very sparingly set with setae. .... **leucanthemi (Schrank)**

120(119) Antennal 3 of female 2-2.3 times as long as broad. Antennae longer and slenderer. Joint 4 wholly dark, seldom with paler spot at base below. Wings hyaline or nearly so. Double fringe hairs 6-9. Frons of female densely set with grey hairs. .... **angusticornis Pr.**

121(118) Tube shorter, 2.3-2.8 (usually 2.6) times as long as broad at base. Epimeral bristles developed, but short.

122(123) Antennae wholly dark (cf. *alpicola*). Head transverse (female unknown as yet). .... **cf. propinquus Bagn.**

123(122) Antennae not quite dark, joints 3, 4 and sometimes also 5 paler at base, at least below. If antennae dark, head elongate, not transverse.

124(125) Head large and square. .... **quadraticeps Bagn.**

125(124) Head not so large, somewhat longer than broad.

126(127) Bristles on segment IX very short, the longest measuring 45 μ. Fore legs wholly dark. .... **nigricans Bagn.**

127(126) Bristles on IX longer.

128(133) Tooth of fore tarsi very minute (5).

129(132) Antennal joint 3 moderately long, strongly asymmetrical, exterior margin slightly concave, interior margin *convex*. Antennal 4 pale at base. Basal half of wings sometimes slightly shaded.

130(131) Tube length, 138(50) μ. .... **setigeriformis Fábián**

131(130) Tube length, 125-130(47-49) μ. .... **eryngii Bagn.**

132(129) Antennal joint 3 much elongate, slightly concave at exterior margin, nearly straight interiorly. Wings more or less distinctly shaded in basal half. .... **purpurifer spec. nov.**

133(128) Tooth of fore tarsi small, but easily discernible. Joint 3 *not* concave exteriorly. Joint 4 (or also 5) pale at base.

134(135) Smaller species, on leguminous plants. Double fringe hairs 6-9. Eyes length about 60 μ. Fore tibiae pale within. Interior posteromarginal bristle about as long as epimeral. Wings sometimes slightly shaded. .... **niger (Osb.)**

135(134) Larger species. Double fringe 8-13 (exceptionally 7). Wings distinctly infumated.

136(137) Antennal joint 7 much elongate, much longer than 8. Eyes normal, lateral diameter about 88 μ. Fore tibiae dark. Head width 195-204 μ. .... **alpicola spec. nov.**

(5) *H. microsetosus* Bagn., described after a single female, and most likely identical with one of the older species, would come into this group.

137(136) Antennal joint 7 not much elongate. Postoculars conspicuous. .... **cf. statices Hal.**

138(117) Tube short, 0.56-0.67 the length of head. Cheeks straight, narrowed towards base. Eyes only about half as long as cheeks. Antennal joint 3 long, at exterior margin straight, yellowish, shaded distally, 4 often pale at base. **arenarius Pr. (cf. quadraticeps Bagn.)**

139 (48) Tube short, conical, about as in *aculeatus.*

140(291) Body not strikingly bicoloured, blackish brown or black, or paler, often with rich crimson pigmentation (cf. p. 110).

141(286) Macropterous.

142(231) Fore tarsi (of female) with conspicuous or very minute tooth, within.

143(150) Antennae with joints 3-6 yellow in basal half, more or less abruptly dark in distal portion.

144(147) Major bristles not sharply pointed.

145(146) Legs and antennae stout, the latter short, joint 3 as in *gowdeyi.* Wings broad. .... **cf. quercinus Pr.**

146(145) Legs and antennae less stout, joint 3 much as in *aculeatus.* ....**cf. limoniastri Pr., cf. gallarum spec. nov.**

147(144) Major bristles sharply pointed (e.g. basal wing bristles and prothoracics).

148(149) Prothoracic bristles very long, yellowish, epimerals 98-110 μ. .... **cf. lundbladi Pr., cf. andryalae Pr.**

149(148) Prothoracic bristles much shorter, 55-68 μ. .... **cf. hukkineni Pr.**

150(143) Colour of antennae not as in *distinguendus.*

151(172) Epimeral bristles pointed.

152(157) Head and antennal joint 3 much elongate, slender.

153(154) Antennae nearly wholly black, joint 3 not even basally clear yellow. Fringe hairs slightly rugose. .... **cf. husseini Pr.**

154(153) Antennae not wholly black.

155(156) Head 1.3 times as long as broad, at the most. Antennae shorter, particularly the terminal joints less elongate; joints 4, 5 and 6 not or little paler at base. Smaller species. .... **retamae End.**

156(155) Head longer, terminal joints more longate. Joints 4, 5 and 6 pale yellow at base, or at least paler. Larger species. ... **andryalae Pr.**

157(152) Antennal 3 not exceptionally slender.

158(159) Fore legs of female strongly incrassate, fore tibiae short and stout, tarsal tooth broadly triangular (6). .... **bolacophilus Pr.**

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(6) cf. *Chiraplothrips*, in which genus, however, the fore femora have apical margin somewhat raised, angular in profile, about as in *Chirothrips*. Joint 4 of antennae with only *two* sensecones.

159(158) Fore legs normal, tarsal tooth not particularly heavy.

160(161) Head large, about as in *pharao;* abdominal tergites VII and VIII with two to four pairs of microsetae between the two dorsal pores or near them. .... **caespitis Pr.**

161(160) Head normal. Tergites VII and VIII medianly with only one to two pairs of minute setulae between or about the pores.

162(163) Antennal joint 3 with only one sense-cone, exteriorly. .... **aculeatus F. (cf. hukkineni)**

163(162) Antennal joint 3 with *two* sense-cones.

164(165) 5 double fringe cilia present. Antennae dark, joints 1 to 3 paler, 4 not so dark as 5 to 8 (most likely only small, dark specimen of *juncorum*). .... **juncicola Bagn.**

165(164) 6-12 double fringe hairs. Antennal 3 yellow, slightly shaded above, 4-6 yellowish brown, paler at base, more or less darker at apex.

166(169) Major bristles shorter, pointed. Wings hyaline. Interior antero-marginal prothoracic bristles small (cf. *niger* (Osb.): 134).

167(168) Head less strongly converging anteriorly, margins of eyes parallel for a short space. Joint 3 of antenna 46-48(28) μ. Tube somewhat stouter. .... **hukkineni Pr.**

168(167) Head more strongly converging anteriorly, margins of the relatively smaller eyes evenly converging. Antennae slenderer, joint 3 : 56-60 (28-32) μ. Tube somewhat longer and narrower. **juncorum Bagn.**

169(166) Major bristles longer, postoculars and pronotals very long, the latter often not quite sharp. Fore wings often slightly shaded. Antero-marginal bristles of pronotum conspicuous.

170(171) Antennal joint 8 constricted at base. Basal wing bristles somewhat shaded. .... **cf. tropicus Pr.**

171(170) Antennal 8 very slender, not constricted at base. Basal wing bristles clear. .... **cf. tritici Kurdj.**

172(151) Epimeral bristles and those at base of fore wing knobbed, blunt or open at tip.

173(174) Prothoracic bristles extremely short, hyaline, infundibuliform. Antennae short, head large. Fore femora with sharply reflexed edge at apex. .... **cf. Aulothrips nubicus nov.**

174(173) Prothoracic bristles not extremely short, not as in *Scopaeothrips*. Fore femora not with sharp exterior apical edge.

175(182) Fore tarsi (of female) with *stout* tooth, arising from a broad base. Fore femora somewhat more strongly incrassate than usual Small species.

176(181) Apices of middle and hind tibiae and the tarsi pale yellow. Bristles

distinctly knobbed, shorter. Antennal joints 3-7 nearly wholly pale yellow.

177(178) Antennal 3 with only one sense-cone. Prothoracic bristles dark. 8-11 double fringe hairs. .... **leptadeniae Pr.**

178(177) Antennal 3 with two sense-cones. Prothoracic bristles pale. 2-7 cilia duplicated.

179(180) Antennal joint 2 only basally dark. Head shorter, narrowed posteriorly. .... **cf. atriplicis Pr.**

180(179) Antennal 2 pale only at apical margin. Head longer, parallel-sided or widened posteriorly. .... **salsolae Pr.**

181(176) Middle and hind tibiae and tarsi dark. Bristles pale, nearly pointed. Colour of antennae about as in *aculeatus*. Antennal 3 very short, almost angular. .... **cf. bolacophilus Pr.**

182(175) Tarsal tooth (of female) small, not arising from a broad base. Fore femora usually only slightly incrassate or simple.

183(186) Head rather large, elongate, cheeks behind eyes twice or more than twice as long as eyes (laterally). Antennae mostly pale yellow (7) from joint 3 to 7 or 8, the latter often shaded. Pronotal bristles not very dark, or hyaline. Tips of middle and hind tibiae often yellow. Basal wnig bristles closely approximated.

184(185) Larger species. At least two pairs of micro-setae on tergites VII and VIII irregularly placed about the two micro-pores. Tips of tibiae often pale. Pterothorax longish. Postoculars pointed. Mesodermal pigment yellowish brown. .... **pharao Pr.**

185(184) Smaller species. Only one pair of micro-setulae usually present about middle of tergites VII and VIII. Tips of tibiae always broadly yellow. Tube very short, 1.4-1.5 times as long as broad at base, and about 0.44 as long as head. With 2-6 interlocated cilia. .... **atriplicis Pr.**

186(183) Head normal, or if large, epimeral bristles of prothorax dark.

187(192) Head and antennal joint 3 exceptionally long and slender.

188(191) Epimeral bristles blunt, knobbed or split.

189(190) Epimerals dark. Large species with long and slender head. Epimerals short. Antero-angulars and antero-marginals small, but well developed. Tarsal tooth conspicuous. .... **kilimandjaricus (Tryb.)**

190(189) Epimerals pale, straight. Tarsal tooth scarcely visible. Double fringe 4-9. .... **cf. karnyi Bagn.**

191(188) Epimeral bristle fine, somewhat curved, nearly pointed. .... **cf. retamae End.**

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(7) Antennal joints 5, 6 and 7 may be strongly shaded apically: f. *arabs* nov.

192(187) Head and antennal joint 3 less slender, or joints 3-5 not wholly pale yellow.

193(196) Epimeral bristles fine, long, *somewhat curved*, narrowed towards blunt tip, not distinctly knobbed. At least joints 6 and 7 pedicellate.

194(195) Joint 8 long and slender, not constricted at base. Eyes larger, parallel-sided behind, for a short space. .... **tritici Kurdj.**

195(194) Joint 8 shortly conical, distinctly constricted at base. Eyes smaller, sides converging. .... **tropicus Pr.**

196(193) Epimerals straight or nearly so, blunt or knobbed or fringed at tip, seldom long and at the same time blunt.

197(204) Postoculars well developed, pointed. Interior sense-cone on joint 3 sometimes vestigial or entirely wanting.

198(203) Epimeral bristles rather pale, or hyaline. Fore wings with 4-7 double fringe cilia.

199(202) Antennal joint 3 constricted at base, not distinctly transversally annulate, joint 7 not pedicellate but constricted at base. Epimerals hyaline.

200(201) Antennal 7, though constricted, with rather broad rim at base, 6 distinctly pedicellate. Antennal 3 elongate, with two sense-cones. Epimeral and basal wing bristles somewhat fringed at tips. Head more elongate (e.g. 190(166) μ). Double fringe 7-9 (seldom 6). Antennals 4-6 strongly shaded. On *Limoniastrum*. .... **balachowskyi spec. nov.**

201(200) Antennal 7 normally constricted, not with broad basal rim, 6 slightly pedicellate. Antennal 3 less elongate, usually with two (a normal exterior and a *rudimentary* interior) sense-cones. Epimeral and basal wing bristles blunt. Head less elongate (e.g. 170(136) μ). Antennals 4-6 very slightly shaded. Double fringe 4-7. On *Gramineae*. .... **eragrostidis Pr.**

202(199) Antennal 3 gradually narrowed towards base, pedicel transversally annulate. Joints 4-6 distinctly shaded with grey. Epimerals often partly shaded. Joints 4 to 7 pedicellate, 6 to 8 much elongate. .... **cf. tritici Kurd.**

203(198) Prothoracic bristles dark. About 8 double fringe hairs. ..**rivnayi Pr.**

204(197) Postocular bristles, though sometimes very fine, blunt or knobbed at tips, or very short. Double fringe 5-10.

205(218) Postoculars and epimerals pale. Mouth-cone often broadly rounded.

206(207) Three to four pairs of discal pronotal micro-setae present. Sides of head distinctly convex, eyes large. Antennae short, three terminal joints rather closely united. Epimerals short. On *Tamarix*. .... **cf. tamaricinus Pr.**

207(206) Only one or two pairs of discal pronotal micro-setae behind fore margin. Antennae normal. Epimerals longer.

208(209) Antennal joint 3 with only *one* sense-cone. Tooth of fore tarsi extremely minute, tarsi appearing unarmed. Wings very narrow. fringe hairs sparingly set, basal wing bristle 3 about twice as long as either 1 or 2. On *Gramineae*. .... **tolerabilis Pr.**

209(208) Antennal 3 with two sense-cones. Tarsal tooth small, but well visible.

210(217) Middle and hind tibiae wholly dark, middle and hind tarsi often dark.

211(212) Wings broad, width across double fringe 90 μ. Bristle 3 of basal wing bristles much longer than either 1 or 2. Legs stout. Antennals 3-6 rather pale. .... **quercinus spec. nov.**

212(211) Wings much narrower. Basal wing bristle 3 not much longer than 1 or 2, strongly knobbed.

213(216) Basal wing bristles longer, 40-44, 46-52 and 60-68, respectively.

214(215) Antennae dark, joint 3 yellow, more or less shaded, 4 and 5 often paler at base. Joint 7 shortly pedicellate at base. Prothoracic bristles hyaline. .... **salloumensis Pr.**

215(214) Antennals 3-6 much paler than the rest, 4-6 yellow at base, joints 1, 2, 7 and 8 as dark as the head. Joint 7 constricted at base. Prothoracic bristles slightly shaded. .... **gallarum spec. nov.**

216(213) Basal wing bristles shorter, 32-40, 36-44 and 44-52 μ, respectively. .... **acanthoscelis (Karny)**

217(210) Middle and hind tibiae yellow at extreme apices, tarsi pale. Epimerals 60-65 μ, antero-angulars 28-32 μ. Basal wing bristles longer than in *salloumensis*. .... **mesembrianthemi Pr.**

218(205) Postoculars and epimerals shaded with grey or blackish. Mouthcone sometimes narrowly rounded or nearly pointed. Antennal 3 usually rather short.

219(230) Antennal joint 6 narrowed at base, but somewhat at apex, too

220(221) Antennal joints 3-7 pale yellow, 8 slightly shaded, sometimes also 7. Prothoracic bristles, even antero-angulars, long. Mouthcone short. Head moderately long. .... **cf. rivnayi Pr.**

221(220) Antennals 7 and 8 wholly dark, as dark as middle or hind tibiae, if 7 light at base, major body bristles shorter.

222(225) Antennae longer, joint 6 : 48-50, joint 7 : 42-48 μ.

223(224) Epimerals well 76 μ. B.3 of wing base *blunt*, 84-88 μ. Antennal 3 stout, rounded. Interior antero-marginal bristle well developed. ... . **strigae Pr.**

224(223) Prothoracic bristles shorter, epimeral about 60 μ, interior antero-marginal bristle extremely minute, B.3 of basal wing bristles pointed, 70 μ. Antennal 3 slender. ..... **kurdjumovi Karny (floricola Pr.)**

225(222) Antennae short and stout, joint 3 : 42(27) μ. Epimerals less than 7 μ (8).

226(227) Interior antero-angular bristle extremely minute. Length of epimeral about 42 μ. Apices of middle and hind tibiae yellow. .... **cf. (Chonothrips) crassicornis John**

227(226) Interior antero-marginal prothoracic bristles well developed. Middle and hind tibiae dark.

228(229) Antennal joint 6 : 40-44, joint 7 : 34-40 μ. B.3 of wing base 48-72 μ. .... **gowdeyi Frkl.**

229(228) Antennal 6 : 37, joint 7 : 34 μ. Length of antennae 265 μ. .... **cf. schultzei Pr.**

230(219) Antennal joint 6 scarcely narrowed towards apex, the three terminal joints somewhat more closely united, antennae short. Disc of pronotum behind fore margin with usually 3-4 pairs of micro-setae. Sides of head convex, eyes large. On *Tamarix*. .... **tamaricinus Pr.**

231(142) Fore tarsi of female without the trace of a tooth.

232(241) Middle and hind tibiae wholly pale yellow, or only slightly shaded with grey at base so that at least all the interior margin remains pale yellow.

233(234) Antennal oint 4 long, about 60 μ, much longer than 3 about 50 μ). Hind tibiae, length 190 μ. .... **longipes Bagn.**

234(233) Antennal 4 much shorter, 55 μ at the most, but in this case legs shorter.

235(236) Larger species, head longer (192(180) μ) Antennal 2 shaded at base. .... **flavitibia Will.**

236(235) Smaller, head shorter and broader, its length at most 160 μ.

237(238) Postocular and mid-lateral bristles of prothorax nearly pointed, postero-angulars (epimerals) only slightly blunt. B.3 of basal wing bristles pointed. 7 double fringe hairs. .... **globiceps (Bagn.)**

238(237) Postocular and all prothoracic bristles distinctly blunt, black, with tip hyaline. Interior antero-marginal bristle of pronotum vestigial.

239(240) Bristle 3 of wing base *knobbed*. B.1 on segment IX blunt. Length (breadth) of antennal 4 : 42-44(26). .... **knechteli Pr.**

240(239) Bristle 3 of wing base (65-68 μ) *pointed*. B.1 on segment IX pointed. Length (breadth) of antennal 4 : 47(23) μ. .... **amygdali spec. nov.**

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(8) *niger* (Osb.) and *eryngii* Bagn. have much darker antennae and tube much narrower, not exactly conical.

241(232) Middle and hind tibiae dark, or yellow at apices only, middle tibiae pale yellow in apical half, at the most.

242(269) Middle and hind tibiae abruptly pale yellow at apices, or only middle tibiae so.

243(266) Epimeral bristles blunt or knobbed.

244(265) Interior antero-marginal bristles of pronotum well developed

245(264) Prothoracic bristles dark with hyaline tips.

246(253) Basal wing bristles dark or very distinctly shaded with grey, bristles at sides of abdomen dark.

247(250) Middle and hind tibiae dark, little or scarcely paler at apices.

248(149) Antennae very slender. .... **cf. subtilissimus (Hal.)**

249(248) Antenae shorter and stouter. .... **cf. andresi Pr.**

250(247) Middle and hind tibiae distinctly and abruptly yellow at apices.

251(252) Hind tibiae broadly yellow at apices. **phyllireae Bagn. (cypriotes Pr.)**

252(251) Hind tibiae very narrowly or scarcely paler, at apices. **andresi Pr.**

253(246) Basal wing bristles hyaline or nearly so

254(255) Antennae comparatively very slender, joint 3 about 2.3-2.4 times as long as broad. 9-12 cilia duplicated. Apices of middle and hind tibiae only at extreme apices narrowly yellow. .... **ochradeni Pr.**

255(254) Antennae less slender.

256(259) Antennal 2 (except at inner margin) pale yellow in apical half.

257(258) Head slender. Less than distal half of middle tibiae yellow. On *Salvadora persica*. .... **salvadorae spec. nov.**

258(257) Head less slender. Distal half of middle tibiae yellow. .... **cf. rabinovitchi Pr.**

259(256) Second antennal joint not pale yellow in apical third or half, paler only at apical margin.

260(263) Antennae more elongate, joint 6 more than twice as long as broad. Middle and hind tibiae abruptly pale yellow at apices.

261(262) Middle and hind tibiae with extreme tips only yellow. ....**maroccanus spec. or ssp. nov.**

262(261) Middle tibiae yellow in apical half, hind tibiae in apical third or more. .... **rabinovitchi Pr.**

263(260) Terminal antennal joints less elongate, 6 scarcely twice as long as broad. Small species. Middle and hind tibiae pale yellow in apical fourth or third. In flowers of *Olea europaea*. ...... **siwanus spec. nov**

264(245) Prothoracic bristles hyaline, or only very little infumated. Head nearly parallel-sided. Tibiae only slightly pale at apices. .... **confinis spec. nov.**

265(244) Interior antero-marginal bristle of pronotum vestigial, not larger than the discal pair of micro-setae. Head short, about as long as

broad. Small species. Middle and hind tibiae broadly yellow at apices. .... **minutus Uz.**

266(243) Epimeral bristles pointed.

267(268) Head somewhat broader than long. B. 1, 2 of basal wing bristles 40 μ. Antennae less slender than in *phyllophilus*. .. **pineticola Bagn.**

268(267) Head longer than broad. Antennae slenderer. Bristles 1 and 2 of wing base 48-52 μ, b.3 : 56 μ. .... **phyllophilus Pr.**

269(242) Middle and hind tibiae wholly dark, not abruptly yellow at apices.

270(271) Antennae very short, about 250 μ, joint 3 even shorter and stouter than in *gowdeyi*. Head broader than long. Postoculars and interior antero-angular prothoracic bristles very small. (May be abnormal specimen of *tamaricinus* with rudimentary tarsal tooth). .... **eothripinus Pr.**

271(270) Antennae normal. Head usually more or less longer than broad, seldom somewhat broader than long (cf. *cooperi* Mlt.). Postoculars well developed, knobbed.

272(275) Interior antero-angular prothoracic bristles vestigial.

273(274) Fore tarsi with very small tooth that is only visible in certain direction. Similar to *subtilissimus*. ....**cf. kurdjumovi Karny (floricola Pr.)**

274(273) Fore tarsi unarmed. Small species, having short antennae, joint 3 : 36(22), joint 4 : 42(29) μ. Wings narrow with 5-6 double fringe cilia. ....**avenae spec. nov.**

275(272) All antero-marginal prothoracic bristles well developed, interior ones usually somewhat smaller than angulars.

276(283) Prothoracic bristles strongly infumated. Tarsal tooth wanting.

277(278) Basal wing bristles strongly shaded. Larger species. Foe tibiae much infumated. Abdominal bristles dark. **cf. subtilissimus (Hal.)**

278(277) Basal wing bristles pale.

279(280) Epimeral bristles shorter, 35-48 μ. Double fringe 6-7. Antennal joints shorter, 6-8 : 39, 33, 22 μ. Small species. ...... **sorghi Bagn.**

280(279) Prothoracic bristles and terminal antennal joints longer.

281(282) Head and antennae very slender. Hind tibiae in most cases yellow at extreme apices. On *Ochradenus baccatus*. ... **cf. ochradeni Pr.**

282(281) Head and antennae less slender. Tibiae of middle and hind legs always wholly dark. Antennae varying in colour. .... **cahirensis (Tryb.)**

283(276) Prothoracic bristles nearly hyaline. Wings very narrow, fringe comparatively widely spaced. Tarsal tooth wanting or extremely small. On *Gramineae*.

284(285) Head elongate, cheeks nearly parallel-sided. Middle and hind tibiae

slightly paler to narrowly yellow at apices. Epimeral bristles longer. Tarsal tooth entirely wanting. .... **cf. confinis spec. nov.**

285(284) Head normal, cheeks slightly arched. Middle and hind tibiae dark. Smaller species. Tarsal tooth extremely small. . **cf. tolerabilis Pr.**

286(141) Brachypterous forms; if femora yellow, cf. 291.

287(288) Antennae more than twice as long as head, wholly black. Head at least 1.4 times as long as broad. Legs dark. .... **cf. Pezidothrips robiniae (Pr.)**

288(287) Head and antennae short. Tibiae yellow at apices.

289(290) Antennae less stout, joint 3 of *minutus* : 42(22) μ.

a(b) Fore tarsi unarmed. Basal wing bristles dark. ......**cf. minutus Uz.**

b(a) Fore tarsi with minute tooth. Basal wing bristles hyaline. .... **minutulus Pr.**

290(289) Antennae stout, joint 3 : 42(27) μ. Fore tarsi with tooth. ....**cf. (Chonothrips) crassicornis John**

291(140) Body strikingly bicoloured, at least prothorax and femora yellow or orange.

292(293) Legs yellow. Body slender. .... **flavicinctus (Karny)**

293(292) Tibiae dark. Body and antennae stouter. .... **cameroni Pr.**

294 (45) Males.

295(296) Body bicoloured, femora lighter than tibiae. .... cf. 291

296(295) Body nearly unicolorous.

297(298) Antennal joint 4 with three sense-cones. Very large species, having very broad wings, and clear, closely set fringe cilia. On *Cistanche*. .... **giganteus Pr.**

298(297) Antennal 3 with one or two, or without sense-cones.

299(383) Basal wing bristles distinctly knobbed, or somewhat fringed at tips, often stout, dark, with white tips (cf. p. 114).

300(307) Middle and hind tibiae pale yellow, not at all darkened, or only slightly so at base, in all cases the whole interior margin pale yellow.

301(302) Antennal joint 4 about 60 μ long, longer than 3(50 μ). Length of hind tibiae about 190 μ. .... **longipes Bagn.**

302(301) Antennal 4 shorter, at most 55 μ. Legs shorter.

303(304) Larger species, head longer, 192(180) μ. ....**flavitibia Will.**

304(303) Smaller, head shorter and broader, its length at most 160 μ.

305(306) Basal wing bristle 3 pointed. Bristle 1 of segment IX pointed. Antennal joint 4 at least twice as long as broad. .... **amygdali Pr.**

306(305) Basal wing bristles 1-3, and bristle 1 of segment IX pointed. Antennal 4 about 1.7 times as long as broad. .... **knechteli Pr.**

307(300) Middle and hind tibiae dark, or pale yellow at apex, or in apical half, at the most.

308(350) Prothoracic bristles dark or strongly shaded with grey.

308(326) Basal wing bristles dark, at least b.1 and b.2 so.

310(321) Middle and hind tibiae wholly dark, not abruptly yellow at apices.

311(312) Antennae comparatively short and stout, joint 3 very short, strongly convex laterally, particularly so at inner margin near base. Pseudovirga very slender, split and slightly prong-shaped. .... **gowdeyi (Frkl.)**

312(311) Antennae more elongate, joint 3 not very short and convex.

313(318) Bristles at sides of abdomen dark.

314(315) Head well 1.4 times as long as broad. Bristles on pronotum short. Pseudovirga somewhat prong-shaped at apex, but stouter than in *gowdeyi*. .... **kilimandjaricus (Tryb.)**

315(314) Head less elongate.

316(317) Lanceolate apical portion of pseudovirga about as long as broad, forming a pointed arch. .... **subtilissimus (Hal.)**

317(316) Lanceolate apical portion of pseudovirga shorter. (Immature specimens may have even the middle tibiae wholly dark) .... **cf. andresi Pr.**

318(313) Bristles at sides of abdomen pale or slightly shaded. Antennae less slender.

319(320) Tarsi yellow, antennals 3-6 yellow. Small species. Pseudovirga slightly bilobed at extreme tip. .... **rivnayi Pr.**

320(319) Tarsi of middle and hind legs dark. Antennals 4-6 more or less infumated. Mouth-cone long, nearly pointed. Pseudovirga very slender, somewhat constricted before apex, scarcely incised at tip. .... **strigae Pr.**

321(310) Middle and hind tibiae abruptly pale yellow at apices. Bristles at sides of abdomen dark.

322(325) Interior antero-marginal bristles of prothorax developed, though smaller than the angulars. Apical portion of pseudovirga lanceolate, sphaerically triangular, more or less bluntly pointed.

323(324) Middle and hind tibiae pale in their distal two-fifths or more extensively. .... **phyllireae Bagn.**

324(323) Middle tibiae yellow at their extreme apex only, hind tibiae not or only slightly paler at apex. ...**andresi Pr. (cf. subtilissimus (Hal.))**

325(322) Interior antero-marginal bristle of pronotum vestigial. The only sense-cone on segment 3 of antenna often wanting. Small species with short head. Pseudovirga narrowed towards apex, slightly con-

stricted before transverse, slightly pin-headed tip. According to Uzel also brachypterous. .... **minutus (Uz.)**

326(309) All three basal wing bristles pale.

327(337a) Middle and hind tibiae or only the former distinctly pale yellow at apices. Interior antero-angular bristle of pronotum well developed.

328(333) Antennal joint 2 pale yellow about in apical half, darkened at margins only, dark at extreme base.

329(330) Head more elongate, 1.2 times as long as broad. Tibiae more broadly yellow at apices. Pseudovirga somewhat constricted before apex, with divergent points at tip. .... **salvadorae spec. nov.**

330(329) Head less elongate, at most 1.1 times as long as broad.

331(332) Tibiae only narrowly pale yellow at apices. Pseudovirga with transverse pin-head at tip. .... **leptadeniae Pr.**

332(331) Tibiae broadly yellow at apices, middle tibiae yellow about up to middle of length (male unknown as yet). .... **cf. rabinovitchi Pr.**

333(328) Antennal joint 2 dark, only slightly paler at apex, not pale yellow in apical half.

334(337) Terminal antennal joints much elongate, joint 6 more than twice as long as broad.

335(336) Middle tibiae somewhat more broadly pale yellow. Interior antero-angular pronotal bristles somewhat shorter than angulars. Prothoracic bristles shorter. .... **maroccanus Pr.**

336(335) Middle tibiae very narrowly pale yellow at apices. Pronotal bristles longer, interior antero-marginals as long as antero-angulars. .... **ochradeni Pr.**

337(334) Antennae less elongate, joint 6 scarcely twice as long as broad. Middle and hind tibiae rather broadly yellow at apices for about one-fourth to one-third of their lengths. .... **siwanus spec. nov.; cf. rabinovitchi Pr.**

337a(327) Middle and hind tibiae wholly dark.

338(343) Interior antero-angular bristles of pronotum vestigial, developed as micro-setae only.

339(340) Antennae wholly dark, joint 3 only slightly paler than the rest. Middle and hind tarsi blackish brown. .... **maltbaeki Bagn.**

340(339) Antennae much paler.

341(342) Pseudovirga slightly widened towards apex, broadly truncate at apex. Antennal 3 with *one* sense-cone. .... **kurdjumovi (Karny)**

342(341) Pseudovirga slightly widened towards apex, margins incrassate, apex split in the middle. 5 double fringe hairs. Antennal 3 with *two* sense-cones. .... **cf. schultzei Pr.**

343(338) Interior antero-marginal bristles of pronotum developed, but sometimes shorter than angulars.

344(347) Antennal 3 with only *one* sense-cone. Pseudovirga not or slightly dilated apically, forming a short, pointed arch.

345(346) Legs and bristles on pronotum longer, the latter about 50 μ. Pseudovirga not widened before apex. .... **cahirensis (Tryb.)**

346(345) Bristles and legs shorter. Pseudovirga very slightly widened before apex. .... **sorghi Bagn.**

347(344) Antennal 3 with *two* sense-cones.

348(349) Pseudovirga slightly widened towards apex, margins stiffened, apex, split. About 5 double fringe cilia. .... **schultzei Pr.**

349(348) Pseudovirga very slender, not widened towards apex, narrowly rounded at apex. 8-10 double fringe cilia present. .... **gallarum spec. nov.**

350(308) Bristles on prothorax pale or very slightly shaded with grey.

351(352) Prothoracic and basal wing bristles very short, dilated and fringed, postoculars vestigial. Pseudovirga split at tip. Wings broad. .... **cf. Aulothrips nubicus nov.**

352(351) Major pronotal bristles not fan-shaped.

353(362) Middle and hind tibiae pale yellow at apices (9).

354(359) Fore femora strongly incrassate, fore tarsal tooth arising from very broad base.

355(358) Pseudovirga bifid at tip.

356(357) Cheeks converging towards base. Antennal 2 dark only at base and at margins. .... **cf. atriplicis Pr.**

357(356) Cheeks widened towards base. Antennal 2 pale at apex only. .... **cf. salsolae Pr.**

358(355) Pseudovirga not bifid at apex. .... **cf. 360**

359(354) Fore femora only slightly incrassate, fore tarsal tooth small or vestigial.

360(361) Head narrowed towards base. Eyes about half as long as cheeks behind them, or little more. .... **cf. pharao Pr.**

361(360) Head nearly parallel-sided, eyes much more than half as long as cheeks. Postocular bristles much longer. .... **confinis spec. nov.**

362(353) Middle and hind tibiae wholly dark.

363(364) Very small species. Disc of pronotum about middle with more than two pairs of micro-setae. Epimeral bristles short. Antennal 6 scarcely narrowed towards apex. Cheeks distinctly convex. Pseudo-

(9) *H. mesembrianthemi* Pr., the male of which is not known, may come into this group.

virga slender, somewhat widened at apex, narrowly rounded at tip. On *Tamarix*. .... **tamaricinus Pr.**

364(363) Not the above characters combined.

365(366) Antennae nearly wholly dark, even joint 3 strongly infumated. Wings shaded. Pseudovirga broadly spoon-shaped, split apically. .... **cf. pannonicus Fábián**

366(365) Antennae much paler, if dark, pseudovirga not split apically.

367(368) Postocular bristles long, pointed. .... **cf. eragrostidis Pr.**

368(367) Postocular bristles blunt.

369(372) Antennal joint 3 with only *one* sense-cone. Slender species, inhabiting *Gramineae*.

370(371) Interior antero-marginal prothoracic bristles well developed. .... **tolerabilis Pr.**

371(370) Interior antero-marginal bristles of pronotum vestigial, not larger than a discal micro-seta. .... **avenae spec. nov.**

372(369) Antennal 3 with two sense-cones. Mostly larger species.

373(374) Wings broad, strongly narrowed at middle. Pseudovirga abruptly constricted before apex. .... **quercinus spec. nov.**

374(373) Wings narrow. Pseudovirga differently shaped.

375(376) Pseudovirga pin-headed at apex, somewhat split or bilobed (Plate, fig. 9) .... **limoniastri Pr.**

376(375) Pseudovirga not pin-headed, either lanceolate, or of even width throughout.

377(380) Antennal joint 7 somewhat pedicellate at base.

378(379) Antennal joint 3 transversely annulated or rugose at base. Postocular and prothoracic bristles pointed. Terminal antennal joints slender. Pseudovirga scarcely widened before apex. .... **tritici (Kurdj.)**

379(378) Antennal 3 with sub-basal thickening, not transversely rugose. Postocular and prothoracic bristles hyaline, knobbed. Pseudovirga with distinctly lanceolate apical portion. .... **salloumensis Pr.**

380(377) Antennal 7 constricted at base, not with short pedicel. Major bristles knobbed.

381(382) Pseudovirga very slender, not widened, but of even width to apex, tip rounded. .... **cf. gallarum Pr.**

382(381) Pseudovirga narrowed towards apex, not distinctly pin-headed, lateral margins somewhat knobbed at tip. .... **acanthoscelis (Ka.)**

383(299) Basal wing bristles pointed or slightly blunt, but not knobbed at tips, and never blackish with abruptly white, blunt tips.

384(387) Middle and hind tibiae abruptly pale yellow at apices, tarsi pale yellow. Tube short.

385(386) Fore femora stout, fore tarsal tooth arising from a broad base. Pseudovirga somewhat bifid at tip. .... **salsolae Pr., atriplicis Pr.**

386(385) Fore femora slightly incrassate. Fore tarsal tooth small. Pseudovirga slender, not widened towards apex, but ductus ejaculatorius somewhat protruding beyond tip. .... **pharao Pr.**

387(384) Middle and hind tibiae wholly dark, or only slightly paler, not abruptly pale yellow at apices.

388(397) Antennal joint 3 with only *one* sense-cone. Tube short.

389(392) Bristles on prothorax and at sides of abdomen dark.

390(391) Basal wing bristles dark. Pseudovirga widened towards apex, apical portion broader than long, apex broadly rounded. .... **phyllophilus Pr.**

391(390) Basal wing bristles pale. .... **pineticola Bagn.**

392(389) Bristles on prothorax and on sides of abdomen scarcely shaded.

393(396) Prothoracic bristles blunt. Terminal antennal joints very slender.

394(395) Pseudovirga slender, slightly narrowed towards apex, split to bifid at tip. Antennal 3 scarcely twice as long as broad (36(20) μ). Joints 4-6 brownish yellow. .... **eragrostidis Pr.**

395(394) Pseudovirga slender, not bifid, rounded at apex, ductus distinctly surpassing tip. Antennal 3 much more than twice as long as broad (e.g.: 48(19) μ), joints 4-6 strongly shaded. .... **balachowskyi spec. nov.**

396(393) Bristles of prothorax sharply pointed. Pseudovirga slender, of even width throughout, apex narrowly rounded. .... **aculeatus (F.)**

397(388) Antennal joint 3 with *two* sense-cones.

398(411) Antennal joints 3 to 6 pale yellow at base, abruptly dark apically.

399(408) All major bristles sharply pointed.

400(403) Major bristles very long, pale. Eyes comparatively small, cheeks longer. Large species.

401(402) Head at most 1.3 times as long as wide. .... **lundbladi Pr.**

402(401) Head slenderer, well 1.4 times as long as wide. Pseudovirga slender, ductus pointed, separating lateral parts of pseudovirga at apex. .... **andryalae Pr.**

403(400) Major bristles moderately long.

404(405) Eyes large, head moderately long. Larger species, living on thistles. Pseudovirga slightly knobbed at apex, tip roundedly truncate. .... **distinguendus (Uz.)**

405(404) Eyes smaller, cheeks longer, head slenderer. Tube short.

406(407) Pseudovirga pin-headed, constricted before apex. **cf. hukkineni Pr.**

407(406) Pseudovirga narrow at tip. .... **cf. juncorum Bagn.**

408(399) Prothoracic and basal wing bristles blunt. Tube short.

409(410) Postocular, prothoracic and basal wing bristles hyaline. .... cf. **limoniastri Pr.**

410(409) These major bristles darkened. Larger species. On *Senecio jacobaea.* .... **senecionis Bagn.**

411(398) Antennals 3 to 6 not coloured as in *distinguendus*.

412(475) Major bristles, at least epimerals and basal wing bristles 2 and 3, sharply pointed.

413(416) Antennal joint 2 pale yellow, slightly darkened at base only.

414(415) All tibiae pale yellow. .... cf. **globiceps Bagn.**

415(414) Middle and hind tibiae dark. Head elongate. Major bristles moderately long. .... cf. **caespitis Pr.**

416(413) Antennal joint 2 dark.

417(448) Interior antero-marginal bristles of prothorax well developed.

418(433) Antennae from joint 4 onwards wholly dark.

419(424) Large species. Fore tibiae dark.

420(423) Wings strongly infumated.

421(422) Major bristles very long, curved. Antennae wholly dark, except joint 3 which is partly paler. Pseudovirga very broad, spoon-shaped at apex, split. .... **graecus Karny**

422(421) Major bristles very moderately long. .... cf. **alpicola nov. spec.**

423(420) Wings almost clear, or with slight yellowish tinge. Head more elongate. Antennals 6 and 7 nearly parallel-sided. .... **biformis Mlt.**

424(419) Mostly smaller forms, slender.

425(430) Epimeral prothoracic bristles long.

426(427) Tube long. Pseudivirga normal. .... **marrubiicola Bagn.**

427(426) Tube short.

428(429) Pseudovirga much widened apically, spoon-shaped. On *Triticum.* ... . **cerealis Pr.**

429(428) Pseudovirga slender, tip of ductus (needle-like) somewhat surpassing lateral parts. .... cf. **retamae Enderl.**

430(425) Epimeral bristles short.

431(432) Head much elongate. Antennal 3 about 2.7 times as long as broad. .... **bodenheimeri Pr.**

432(431) Antennal 4 normal. .... **purpurifer Pr.**

433(418) At least antennal joint 4, usually also 5, even 6, yellowish at base, or spotted with yellow on under side.

434(439) Larger species, having rather long tube and large eyes.

435(438) Wings clear.

436(437) Tube long. Cheeks set with weak spines. Postoculars very long. Very large species. .... **simplex (Buffa)**

437(436) Tube shorter. Cheeks with inconspicuous, very small spines. Postoculars shorter. .... **cf. moestus Pr.**

438(435) Wings usually slightly shaded. Postoculars not very long. Size o *moestus*. .... **alpester Pr.**

439(434) Smaller species. Tube moderately long, or short; eyes moderately large or comparatively small.

440(441) Antennal 7 (like 4 to 6) with distinct pedicel. Tube only slightly concave beyond base, not constricted. .... **cf. tritici (Kurdj.)**

441(440) Antennal 7 narrowed at base or somewhat constricted, not distinctly pedicellate.

442(443) Eyes more than half as long as cheeks behind them. Tube slightly constricted behind base. (The unknown male of *H. ebneri* may come in here). .... **vuilleti Pr.**

443(442) Eyes only about half as long as cheeks behind them.

444(445) Head much elongate, slender, cheeks with weak spines. Pseudovirga with ductus pointed at apex, surpassing lateral parts of pseudovirga. .... **cf. andryalae Pr.**

445(444) Head normal. Pseudovirga normal.

446(447) Wings strongly shaded. Lanceolate part of pseudovirga less elongate. .... **cf. statices (Hal.)**

447(446) Wings clear. Lanceolate apical portion of pseudovirga more elongate (Plate, fig. 3) .... **jasionis Pr.**

448(417) Interior antero-marginal bristle of pronotum extremely small, or micro-seta-like.

449(452) Eyes small, only about half as long as cheeks behind them. Tube short.

450(451) Antennae long and slender, joint 3 much elongate. Postoculars very small. .... **arenarius Pr.**

451(450) Antennae shorter, 3 about as in *aculeatus*. Postoculars well developed. .... **cf. hukkineni Pr., cf. caespitis Pr.**

452(449) Eyes larger, more than half as long as cheeks.

453(456) Wings, nearly for all their length, strongly infumated.

454(455) Pronotal bristles very small. Pseudovirga split apically. .... **leucanthemi (Schrk.)**

455(454) Pronotal bristles, even the antero-angulars, well developed, though not very long. .... **cf. alpicola spec. nov.**

456(453) Wings slightly shaded or hyaline.

457(464) Pseudovirga broadly spoon-shaped apically, and deeply split, the broad apical portion being longer than the pedicel.

458(459) Pseudovirga short, with stout pedicel, broadly rounded apically, split and bilobed. .... **husseini Pr.**

459(458) Pseudovirga not broadly rounded at apex.

460(463) Epimeral bristles long, or well developed.

461(462) Fringe cilia smooth. Basal wing bristles moderately long. .... **cf. cerealis Pr.**

462(461) Fringe slightly plumose. Basal wing bristles long. Antennae dark. .... **anthemidinus spec. nov.**

463(460) Epimeral bristles very short. **purpurifer Pr. (cf. propinquus Bagn.)**

464(457) Pseudovirga not broadly cochleariform.

465(466) Pseudovirga with small, transverse pin-head at tip. Eyes comparatively small. Antennals 4 and 5 (and sometimes 6) yellowish at base. On *Gramineae* (e.g. *Phragmites*). .... **hukkineni Pr.**

466(465) Pseudovirga either slender, or even width throughout, or somewhat lanceolate apically, not with transverse pin-head.

467(470) Pseudovirga slender, not distinctly widened apically.

468(469) Bristles on prothorax and postocular bristles short. Antennal 3 much elongate. Tube long, nearly parallel-sided. Fringe cilia roughened. Pseudovirga not split. .... **angusticornis Pr.**

469(468) Bristles on prothorax conspicuous. Antennal 3 short, much convex interiorly near base. Tube short, conical. Pseudovirga slender, simple, but slightly split apically. .... **caespitis Pr.**

470(467) Pseudovirga broader apically than in basal portion.

471(472) Fringe hairs roughened or slightly plumose. Pseudovirga of normal shape, somewhat widened at apex, lanceolate, bluntly pointed. ... . **chrysanthemi Pr.**

472(471) Fringe cilia smooth.

473(474) Antennal 3 elongate, slightly convex interiorly, near base. .... **eryngii Bagn.** (male unknown), **setigeriformis Fábián, niger (Osb.)**

474(473) Antennal 3 short, strongly convex interiorly near base. Postoculars very long. .... **bolacophilus Pr.**

475(412) Major bristles, at least basal wing bristles, not quite sharply pointed, or 1 and 2 of the latter distinctly blunt.

476(481) Eyes comparatively small, cheeks behind them about 2.5 to 2.6 times as long as eyes.

477(478) Head very slender. Tube short. Major bristles long. Pseudovirga as in *andryalae*. Wings clear. ....**cf. retamae Enderl.**

478(477) Head normal. Wings slightly shaded.

479(480) Major bristles very long, curved. Antennal 8 strongly constricted at base. .... **tropicus Pr.**

480(479) Major bristles very moderately long, hyaline or pale grey. Antennal 8 not constricted at base. Sometimes hemimacropterous (f. *mo-*

risoni Pr.). Pseudovirga widened at apex, but dark portion of ductus by far not reaching widened part. .... **statices (Hal.)**

481(476) Eyes larger, cheeks not more than twice as long as eyes.

482(493) Antero-marginal prothoracic bristles comparatively long, even the interiors well developed.

483(484) Tube very long. Major bristles nearly pointed. .... **cf. marrubiicola Bagn.**

484(483) Tube normal or short.

485(488) Antennal 7 only constricted at base, not pedicellate.

486(487) Antennals 4 and 5, and sometimes also 6 pale at base. Tube somewhat concave beyond base. Pseudovirga slender, not widened apically, narrowly rounded at tip. .... **vuilleti Pr.**

487(486) Antennals 5 and 6, and often 4, wholly dark.

488(489) Antennal 3 : 1.8-1.9 times as long as broad. Pseudovirga broadly spoon-shaped at apex, and split. ....**pannonicus Fábián**

489(488) Antennal 3 : about 2.7 times as long as wide. Head very slender. .... **cf. bodenheimeri Pr.**

490(485) Antennal 7 shortly pedicellate at base.

491(492) Basal wing bristles distinctly blunt. Head shorter. Antennae coloured as in *distinguendus*. ....**senecionis Bagn.**

492(491) Basal wing bristles pointed or nearly so. Head elongate, constricted near base. ....**tritici (Kurdj.)**

493(482) At least the interior antero-marginal bristles of the pronotum extremely small.

494(497) Antero-angular pronotal bristles small.

495(496) Antennals 4-8 wholly dark, even joint 3 sometimes dark. Major bristles longer. On *Statice* and *Armeria*. .... **cf. statices (Hal.)**

496(495) Antennals 4 and 5 paler at base, 3 for the greater part yellowish. Smaller species .... **cf. niger (Osb.), setigeriformis Fábián**

497(494) Antero-angular pronotal bristles well developed.

498(499) Wings broad. Bristles 1-3 of wing base knobbed. .... **cf. maltbaeki Bagn.**

499(498) Wings narrow. Bristles of wing base blunt.................................. .... **helianthemi Oett., jasionis spec. nov.**

Plate

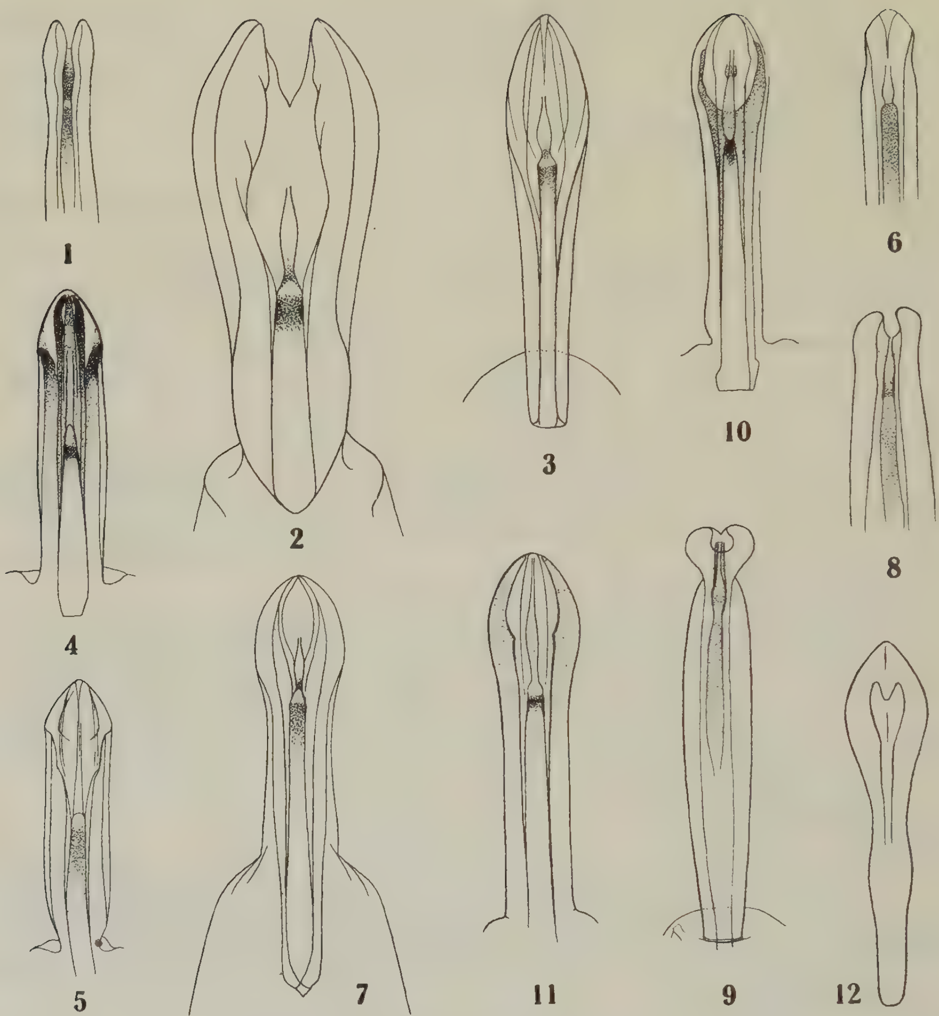

Fig. 1: *Aulothrips nubicus* gen. et spec. nov., male, apex of pseudovirga of aedeagus. — Fig. 2: *Haplothrips anthemidinus* spec. nov., male, apex of aedeagus (pseudovirga). — Fig. 3: *Haplothrips jasionis* spec. nov., male, apex of aedeagus (pseudovirga). — Fig. 4: *Haplothrips cahirensis* (Trybom), male, apex of aedeagus (pseudovirga). — Fig. 5: *Haplothrips siwanus* spec. nov., male, apex of aedeagus (pseudovirga). — Fig. 6: *Haplothrips tolerabilis* Pr., male, apex of pseudovirga of aedeagus. — Fig. 7: *Haplothrips alexandrinus* Pr., male, pseudovirga. — Fig. 8: *Haplothrips jordanicus* Pr., male, apex of pseudovirga of aedeagus. — Fig. 9: *Haplothrips limoniastri* Pr., male, pseudovirga. — Fig. 10: *Haplothrips salloumensis* Pr., male, pseudovirga. — Fig. 11: *Haplothrips tritici* (Kurdj.), male, pseudovirga. — Fig. 12: *Haplothrips propinquus* Bagn., male, pseudovirga (rough sketch). — B. Assaad del.

New and known Alaptids and Mymarids from Egypt

[Hymenoptera-Chalcidoidea]

by WALTER SOYKA

In a collection of Mymarids from Egypt which Dr. H. Priesner sent to me the following species were found :

ALAPTIDAE

(Soyka, *Entomol. Nachrichten*, Burgdorf, Schweiz)

Alaptus pallidicornis Förster

10 females, 23 males. A few of the specimens, especially the males, are wholly pale, and there are some differences in the antennae ; this may be due to treatment of the specimens with KOH, as they belong to the old collection, made by the Coccidologist Mr. Hall.

Localities : 2 ♀♀, 1 ♂, Egypt, El-Areesh, 1.xii.1934, on Citrus with *Leucanium hesperidum*, leg. Priesner; 8 ♀♀, 1 ♂, Egypt, Aga, 27.iii.1930, on *Ficus carica;* 1 ♂, Mataria, 4.iv.1923, on *Psidium guyava;* 20 ♂♂, on *Balsamina*.

Alaptus minimus Walker

1 female. The specimen was mounted and identified by Kryger, but the preparation is not satisfactory. It is very difficult, therefore, to state, if it is really this species.

Locality : Egypt, Tanta, 2.ii.1930, on vine leaves with *Retithrips*.

Alaptus aegyptiacus spec. nov.

Similar to *Al. novickyi* Soyka, but greatly differing in the lengths and widths of the antennal joints.

Colour : Dark yellowish brown, abdomen darker on one side, eyes black, legs and antennae lighter, and there is also a light brown stripe around

the fore wing. Head transverse, as broad as thorax, antennae inserted near mouth, the head shows similar carinae as in *novickyi;* mesonotum longer than the whole scutellum, postscutellum with 4-5 longitudinal striae, laterally, thorax not as long as abdomen (55:85). Ovipositor longer than abdomen (85:60). Fore wing nearly eight times as long as broad (30:4), with an irregular row of hairs on disc, situated near anterior margin, longest cilia of fore wing nearly four times as long as greatest width of fore wing (70:20), posterior margin distinctly dentiform near base, hind wing very narrow, nearly as long as fore wing. Antennae a little shorter than body, only the club with sensoria, joints with a few rather long hairs, more densely set on the last funicle joints, scape one-fourth longer than pedicel, the latter one-fifth longer than funicle joint 1, funicle joint 2 one-third longer than 1, funicle joint 3 distinctly shorter than 2, a little longer than 1, funicle joints 4 and 5 of equal length, but nearly as long as 3, club three times as long as funicle joint 5.

Measurements in μ : Body, 349; thorax, 130; abdomen, 200; fore wing length, 410, width, 55. Antennae, lengths (widths) : Scape 47(21), pedicel 35(32), funicle joints 28(10), 42(10), 31(12), 28(12), 28(12), club 82(26).

Locality : 1 female (holotype), Egypt, Alexandria, 9.iii.1932, on *Nerium oleander*, with *Saissetia oleae*, *Aspidiotus hederae* and *Pseudococcus longispinus;* 1 male (allotype) Alexandria, 7.vi.1932, from leaves infested with *Chrysomphalus personatus*.

Male : Similar to female, but abdomen and antennae different. Antennae with 10 joints, scape, pedicel and 8 funicle joints. Thorax a little longer than abdomen (56:50), also a little broader (45:42). Scape only a little longer than pedicel, all funicle joints cylindrical, only the last one acute, the first funicle joint being the shortest, the eighth the longest, joint 3 somewhat shorter than the other funicle joints.

Measurements in μ : Body, 300; thorax, 130; abdomen, 118. Antennae, lengths (widths) : Scape, 38(21), pedicel, 31(22), funicular joints cu, 26(12), 35(12), 33(12), 38(14), 38(14), 38(14), 35(16), 40(14).

Alaptus priesneri spec. nov.

Similar to *Al. schmitzi* Soyka, but all funicle joints nearly as long as broad.

Colour of body yellowish brown, eyes black, antennae greyish brown, also legs, but nearly colourless.

Head transverse, as broad as thorax, very short, with the usual carinae around eyes, antennae inserted nearer to the mouth, not in the middle of the face. Body strongly compressed, mesophragme rather short, head one-half as long as thorax (25:45), thorax distinctly shorter than abdomen

(45 : 65), ovipositor distinctly shorter than abdomen (40 : 65), fore legs broader and shorter than middle and hind legs, ovipositor not protruding at the distal end. Fore wing ten times as long as broad (20 : 2), without hairs on disc, fore wing dentiform at posterior margin, near base, and at this dentiform dilatation nearly as broad as at its distal end. Hind wing nearly as long as fore wing. Antennae very short, not as long as the body (17 : 20), club without visible sensoria, all antennal joints with only a few hairs, scape twice as long as pedicel, the latter nearly three times as long as first funicle joint, all funicle joints not much differing in length from one another, but funicle joints 4 and 5 distinctly longer than 1, club nearly five times as long as funicle joint 5, all funicle joints as long as broad.

Measurements in μ : Body, 270; head, 59; thorax, 106; abdomen, 153. Antennae, lengths (widths) of joints : Scape, 59(19), pedicel, 31(12), funicular joints, 12(12), 14(12), 14(12), 16(14), 16(16), club, 28(26).

Locality : 1 female, Egypt, Beni Suef, 1.xi.1931, on *Acacia arabica* (with *Ceroplastes africanus*), leg. H. Priesner.

There are two specimens in the slide. One of them is without wings, the thorax is much shortened, and not half as long as the abdomen, a mesophragme is apparently absent. This is the first wingless specimen of Alaptids or Mymarids I saw.

Anagrus aegyptiacus spec. nov.

Similar to *Anagrus bakkendorfi* Soyka, but distinguished by the smaller fore wings, different antennae, and protruding ovipositor.

Colour light yellowish, eyes black, antennae greyish, legs of the same colour as body, but lighter. Head more globular, broader than thorax, eyes not very large, ocelli arranged in a small and low triangle on vertex, reddish black, head with a carina between eyes that is black in the middle. Pronotum rather long, distinctly visible, thorax longer than broad (16 : 11), abdomen longer than thorax (27 : 16), two and a half times as long as broad, hind legs shorter than body (42 : 50). Fore wing ten times as long as broad (40 : 4), slightly broadened at marginal vein near base, largest marginal cilia three times as long as greatest width of wing (12 : 4), the longest marginal cilia being at the distal end of the posterior margin, disc of fore wing entirely covered with hairs, but only in a few lines, forming four lines where wing broadest; these hairs are rather long; fore wing broadened at the whole extent of marginal vein; hind wing nearly as long as fore wing (38 : 40). Antennae shorter than body (30 : 50), scape with conspicuous sharp carinae, funicle joint 5 and 6 and club with sensoria. Scape twice as long as pedicel, the latter twice as long as funicle joint 1, funicle joint 2

distinctly longer than pedicel, 3 distinctly shorter than 2, 4 a little longer than 3, 5 a little longer than 4, 6 distinctly longer than 5, three times as funicle joint 1, club nearly twice as long as joint 6, and longer than scape.

Measurements in μ : Body 690; thorax 220; abdomen 360; hind legs 580; fore wing 550; hind wing 520. Antennae, lengths (widths) : Scape, 71, pedicel, 35, funicular joints, 17, 42, 38, 45, 47, 52, club, 99.

Locality : 1 female (holotype), Egypt, Giza, Shareh El-Haram, 4.x.1931, on *Gramineae*, leg. H. Priesner; 18 paratypes of the same locality and date, but some of them from November 1930 and 1931.

Male : Colour, head, thorax and wings the same as in the female. Abdomen a little longer than thorax (25 : 21), fore wing ten times as long as broad (40 : 10). Abdomen nearly as broad as thorax (11 : 10), antennae with 13 joints, i.e. scape, pedicel and 11 funicle joints.

Measurements in μ : Body, 610; thorax, 290; abdomen, 340. Antennae, lengths (widths) of joints : Scape, 50, pedicel 35, funicular joints 40(14), 54(17), 52(17), 57(17), 54(19), 54(19), 54(19), 57(21), 54(21), 57(21), 54(17).

Male : Allotype, same locality as holotype ; also four paratypes ; two paratypes, Giza, xi.1931, on *Panicum colonum*, leg. Priesner.

Anagrus unilinearis spec. nov.

Colour of body light yellow, eyes black, antennae light greyish, legs of the same colour as body, wings dusky, especially at distal end and marginal vein. Head transverse, pointed at the mouth, broadly rounded at the vertex. Ocelli in a low triangle, eyes not longer than half of head. Thorax nearly as long as abdomen (17 : 19), the latter as broad as thorax, mesonotum with distinct parapsidal furrows, which are rather broad and deep, antescutellum divided into two parts, mesophragma roundly pointed at distal end, ovipositor not quite as long as abdomen. Fore wing twelve times as long as broad (37 : 3), across marginal vein nearly as broad as at greatest width (12 : 3), a single line of hairs in the middle of the disc, ending before apex of wing where several hairs may be observed. Antennae not as long as body, with only a few hairs, funicle joints 5 and 6 and club with sensoria, scape nearly twice as long as pedicel, funicle joint 1 nearly one-third shorter than pedicel, joints 2 and 4 of equal length, as long as pedicel, funicle joint 5 somewhat longer than 4, funicle joint 6 distinctly longer than 4, club twice as long as funicle joint 5, four times as long as broad, funicle joint 6 three times as long as broad.

Measurements in μ : Body, 580; thorax, 230; abdomen, 260; fore wing 510, hind wing, 460. Antennae, lengths (widths) of joints : Scape, 76(24), pedicel, 40(21), funicle joints, 31(9), 42(12), 42(12), 42(12), 45(14), 47(17), club, 90(24).

Locality : 1 female (holotype) : Egypt, Shareh El-Haram, x.1931, on grasses, leg. H. Priesner.

Male unknown.

MYMARIDAE

Gonatocerus aegyptiacus spec. nov.

Similar to *Gonatocerus sulphuripes* Förster, but showing differences in the antennae and the wings.

Colour of body dark yellowish brown, legs greyish, antennae as well, but darker than legs, eyes black, abdomen lighter at base.

Head rounded, broader than thorax, antennae inserted near vertex, eyes round, a little more than half as long as head, ocelli in a nearly rectangular triangle, head widened at the vertex. Thorax shorter than abdomen (23 : 27). Ovipositor as long as abdomen, not exserted at the distal end. Mesonotum longer than scutellum (11 : 8), scutellum as long as metanotum, hind legs nearly as long as body (60 : 62), abdomen not as broad as thorax. Fore wing four and one-half times as long as broad (62 : 14), longest marginal cilia half as long as greatest width of wing (7 : 14), marginal vein one-sixth of greatest length of wing, fore wing well rounded at distal end, hind wing shorter than fore wing (50 : 62), hairs on disc of fore wing short and rather dense, greatest width of fore wing near distal end. Antennae shorter than body (47 : 62), only club and funicle joint 8 with sensoria, hairs on antennae fine and sparce, radicula half as long as scape, the latter nearly twice as long as pedicel, pedicel one-third longer than first funicle joint, funicle joint 2 a little longer than 1, funicle joint 3 distinctly longer than 1, funicle joint 4 one-fourth shorter than 3, funicle joint 5 distinctly shorter than 4, funicle joint 6 somewhat longer than 4, funicle joint 7 distinctly shorter than 6, but a little longer than 5, funicle joint 8 as long as 3, club five times as long as funicle joint 7, nearly four times as long as broad.

Measurements in μ : Body, 860 ; thorax, 320 ; abdomen, 360 ; fore wing, 860, hind wing, 670 ; hind legs, 830. Antennae, lengths (widths) of joints : Scape, 101(35), pedicel, 59(33), funicular joints, 40(19), 42(17), 45(17), 33(18), 28(19), 35(21), 31(21), 45(26), club, 153(40).

Male : Colour, thorax head and wings as in the female, differing only in the antennae and the abdomen, the latter as long as the thorax, in lateral aspect, however, smaller than the thorax. Antennae with 13 joints, scape, pedicel and 11 funicle joints, scape nearly twice as long as pedicel, which is distinctly shorter than first funicle joint, the following joints more or less longer than first funicle joint, all funicle joints cylindrical, with the exception of the last which is pointed, and is the longest of all. All funicle joints with sensoria.

Measurements in μ : Body, 860; thorax, 340; abdomen, 340; fore wing, 890. Antennae, lengths (widths) of joints : Scape, 90(28), pedicel, 50(33), funicular joints, 64(26), 68(21), 76(26), 68(21), 76(24), 71(21), 76(21), 76(21), 78(24), 76(24), 83(26).

Locality : Female (holotype) and 13 females (paratypes), Egypt, Giza, Shareh El-Haram, x.1931, on grasses; 16 females (paratypes), Giza, xi.1931 and 4.xi, from *Panicum colonum* and Citrus (2 females); 1 female (paratype), Oasis Dakhla, Gedida, 2.ii.1932; 1 male (allotype), Giza, 12.x.1931, from *Panicum colonum;* 1 male (paratype), Giza, 12.x.1931, from *Citrus* tree; leg. H. Priesner.

Gonatocerus africanus spec. nov.

Colour yellow, with greyish brown and blackish, eyes black, antennae greyish brown. Head transverse, somewhat broader than thorax, antennae inserted in the middle of the face. Thorax as long as abdomen (25:25), also nearly as broad as abdomen, not exserted at the distal end. Body slender, hind legs longer than body (70:59). Fore wings nearly four times as long as broad (58:16), longest marginal cilia one-third of greatest width of wing (8:16), hind wing distinctly shorter than fore wing (45:58). Antennae a little longer than body (65:59), funicle joints very broad, scape more than twice as long as pedicel, the latter as long as funicle joint 8, but broader, funicle joint 1 as long as funicle joint 2, funicle joint 3 as long as 4, but distinctly longer than 2, funicle joint 5 longest, distinctly longer than 4 or 6, funicle joint 7 somewhat shorter than 5, funicle joint 8 distinctly shorter than 7, club nearly three times as long as funicle joint 8, ad four times as long as broad.

Measurements in μ : Body, 810; thorax, 340; abdomen, 340; fore wing, 800, hind wing, 620. Antennae, lengths (widths) of joints : Radicula, 52, scape, 118(38), pedicel, 52(40), funicular joints, 35(24), 33(21), 52(26), 59(28), 61(33), 57(31), 54(28), 19(33), club, 151(38).

Locality : 1 female (holotype) and 2 females (paratypes), Egypt, Dakhla Oasis, Gedida, 21.iii.1932, collected in orange grove by H. Priesner.

Gonatocerus dakhlae spec. nov.

Colour of body light yellow with a little brownish, base of the abdomen nearly colourless, antennae greyish brown, darker than body, eyes black, ocelli reddish black, carina between eyes in the middle blackish. Head transverse, eyes one-half as long as head, a carina between middle of eyes, ocelli in a low triangle, head pointed at mouth, especially at mandibles; head in form of a rounded triangle, antennae inserted in the middle of face, scutellum and antescutellum united as long as mesonotum. Abdomen some-

what longer than thorax (25 : 20), ovipositor shorter than abdomen, the latter broadest near base, pointed at distal end. Fore wing somewhat more than one-half of the greatest width of wing, marginal vein one-seventh of wing's length, cilia on disc very short, but not very dense, especially at marginal vein, posterior margin of fore wing broken in the middle, hind wing shorter than fore wing (40 : 50). Antennae as long as body (50 : 51), funicle joints 5, 7, 8 and club with sensoria, hairs on antennae very fine, radicula not quite one-half of scape, pedicel a little shorter than radicula, funicle joint 1 as long as 3, funicle joint 2 shortest, distinctly shorter than 1, funicle joint 4 nearly as long as 3, funicle joint 5 distinctly longer than 4, as long as 7, club distinctly longer than scape, nearly three times as long as pedicel, nearly four times as long as broad, funicle joints 6 to 8 twice as long as broad, and this nearly also applies to the other funicle joints.

Measurements in μ : Body, 690 ; thorax, 340 ; abdomen, 280 ; fore wing, 690, hind wing, 550. Antennae, lengths (widths) of joints : Radicula, 52, scape, 116(23), pedicel, 47(31), funicular joints, 35(15), 28(17), 35(17), 38(17), 50(21), 40(19), 50(24), 50(24), club, 137(35).

Locality : 1 female (holotype), Egypt, Dakhla Oasis, Gedida, 21.iii.1932, on orange blossom, leg. H. Priesner.

Male unknown. Host unknown.

Gonatocerus flavus spec. nov.

Similar to *litoralis* and *priesneri*, but showing differences in the fore wing, the cilia being stouter and more dense, the whole wing being shorter.

Colour of body light yellowish brown, eyes black, ocelli reddish black, antennae greyish brown. Head transverse, eyes round, half as long as head, ocelli in a low triangle, antennae inserted behind middle of face, thorax nearly as long as abdomen ; parapsidal furrows present as in all other *Gonatocerus* species, hind legs a little longer than body (54 : 50). Fore wing as long as body (50 : 50), nearly five times as long as broad (50 : 10), well rounded at the distal end, longest marginal cilia more than one-half of greatest width of wing, cilia on disc rather long and dense, marginal vein one-seventh of length of wing, costa one-fifth of it (7 : 10 : 50). Antennae nearly as long as body (47 : 50), funicle joints 7 and 8 and club with sensoria, scape two and one-half times as long as radicula, a little more than twice as long as pedicel, funicular joints 1 to 4 of about equal length, one-half of length of pedicel, funicle joints 5, 7 and 8 of equal lengths, a little stouter than pedicel, funicle joint 6 distinctly shorter than 5, club somewhat more than three times as long as funicle joint 8.

Measurements in μ : Body, 690; thorax, 280; abdomen, 320; fore wing, 690. Antennae, lengths (widths) of joints : Radicula, 47, scape, 118, pedicel, 54, funicular joints, 26, 26, 28, 28, 47, 38, 47, 47, club, 153.

Locality: 1 female (holotype), Egypt, Giza, xi.1931, on *Panicum colonum*, leg. H. Priesner.

Host unknown.

Gonatocerus priesneri spec. nov.

Similar to *litoralis* Hal., but fore wing broader and funicle joints different.

Colour of body dark brown, base of abdomen lighter, eyes black, legs and antennae of same colour as body. Head transverse, antennae inserted in the middle of the face, ocelli relatively very large, a transversal carina between eyes, vertex broad. Mesonotum as long as scutellum, metanotum a little shorter, thorax as long as abdomen (23 : 23), ovipositor a little shorter than abdomen, not exserted at the distal end, abdomen distinctly longer than broad (23 : 15). Fore wing three times as long as broad, broadest near distal end (52 : 18), as long as body, cilia on disc short and dense, wanting at base, and only a few present at marginal vein; longest marginal cilia one-third of wing's greatest width (6 : 18), marginal vein one-seventh of wing's length (7 : 52), costa one-fifth of wing's length, hind wing shorter than fore wing (42 : 52). Antennae not as long as body (41 : 50), funicle joints 5, 7 and 8, and club with sensoria, hairs short, scape and radicula united three times as long as pedicel, and twice as long as each of funicular joints 2 to 4; funicle joint 1 shorter than pedicel, but distinctly longer than funicle joint 2, funicle joint 5 only a little shorter than pedicel, funicle joint 6 nearly as long as funicle joint 1, funicle joint 7 as long as 5, and funicle joint 8 as long as pedicel, club nearly three times as long as funicle joint 8, and nearly four times as long as broad.

Measurements in μ : Body, 690; thorax, 320; abdomen 320; fore wing, 720, hind wing, 580. Antennae, lengths (widths) of joints : Scape, 141(33), pedicel, 47(28), funicle joints, 31(17), 24(17), 24(19), 24(19), 42(21), 33(19), 40(24), 47(26), club, 139(35).

Male : Thoarx, head and wings as in the female, antennae with 13 joints, i.e. scape, pedicel and 11 funicle joints. Abdomen distinctly shorter than thorax (18 : 21), fore wing also nearly three times as long as broad, (47 : 17). Of the antennae, the radicula measures over one-half of scape, the latter relatively much shorter than in the female, the pedicel only two-thirds as long as scape, all funicle joints distinctly longer than scape or pedicel, funicle joints 5 to 10 each twice as long as pedicel.

Measurements in μ : Body, 650; thorax, 290; abdomen, 250; fore wing, 110. Antennae, lengths (widths) of joints : Radicula, 24(17), scape, 42(28),

pedicel 28(35), funicular joints, 50(31), 50(26), 50(24), 52(26), 57(28), 57(28), 57(26), 54(24), 61(24), 57(26), 66(24).

Locality : 1 female (holotype) and 3 females (paratypes), 1 male (allotype) and 1 male (paratype), Egypt, Gebel Elba, Wadi Aideb, 1.ii.1933, on *Lycium* spec., leg. H. Priesner.

Maidliella aegyptiaca spec. nov.

Colour of body dark brown, eyes black, base of abdomen lighter, legs fulvous, antennae brown, except scape and pedicel which are nearly colourless, last tarsal joint brown.

Head globular, eyes very large; head a little broader than thorax (15 : 13), antennae inserted in the middle of the face, head one-half as long as thorax, (10 : 22), abdomen (without ovipositor) longer than thorax (30 : 22), ovipositor much protruding at the disal end, petiolus measuring nearly one-third of abdomen (10 : 30), thorax well rounded, hind legs not quite as long as body (66 : 76), all legs very slender. Fore wing four times as long as broad (68 : 17), longest marginal cilia two-thirds as long as greatest width of wing, width of wing at apex of marginal vein one-fourth of greatest width of wing, fore wing somewhat pointed at apex, cilia on disc rather short and dense, hind wing shorter than fore wing (50 : 61). Antennae not as long as body (50 : 76), scape with transversal lines, joints 1 to 3 of funicle very slender, scape swollen, club broadened at middle; scape twice as long as funicle joint 1, pedicel one-fifth longer than funicle joint 1, funicle joint 2 distinctly longer than scape, funicle joint 3 shorter than 2, as long as 6, funicle joint 4 a little longer than 1, 5 longer than 4, but shorter than 3, club a little more than twice as long as funicle joint 5.

Measurements in μ : Body, 1050; thorax, 440; abdomen, 480; fore wing, 940, hind wing, 690; hind leg, 910. Antennae, lengths (width) of joints : Scape, 94(35), pedicel, 95(33), funicular joints, 47(12), 104(12), 73(17), 53(18), 59(19), 73(21), club, 125(40).

Male : Colour, head, thorax and wings as in the female, only abdomen and antennae different. Abdomen shorter than thorax (20 : 24), and nearly as broad, fore wing four times as long as broad (64 : 16). Antennae longer than body, scape striate, one-third longer than pedicel, all funicle joints distinctly longer than pedicel or scape, except joints 1 and 10 which are as long as scape; last joint acute.

Measurements in μ : Body, 730; thorax, 320; abdomen, 280; fore wing, 880. Antennae, lengths (widths) of joints : Scape, 73(35), pedicel, 52(38), funicular joints, 73(26), 87(26), 85(24), 83(24), 83(24), 79(24), 83(26), 79(26), 79(24), 73(24), 79(21).

Locality: 1 female (holotype) and 2 females (paratypes), 1 male (allotype), Egypt, Benha, viii.1931, on *Hibiscus esculentus* (infested by *Phenacoccus hirsutus*), leg. H. Priesner.

Host unknown.

Novickyella dakhlae spec. nov.

Colour of body dark brown; legs, scape, pedicel and first funicle joint yellow, petiolus and rest of antennae brown. Head transverse, broadened on vertex, eyes small and rather roundish, antennae inserted in the middle of face; thorax distinctly shorter than abdomen (23 : 31), greatest width of abdomen at middle, ovipositor distinctly exserted at distal end, petiolus one-fourth of abdomen, hind legs not quite as long as body (60 : 67). Fore wing four times as long as broad (59 : 14), longest marginal cilia as long as greatest width of wing (13 : 14), width of wing at the vein nearly one-fourth of greatest width of wing (4 : 14), cilia on disc dense and rather short. Antennae shorter than body (42 : 67), scape without transversal lines, only funicle joint 6 and club with sensoria, scape one-third longer than pedicel, funicle joint 1 one-half as long as scape, funicle joint 2 as long as scape, funicle joint 3 shorter than 2, but longer than 1, funicle joint 5 as long as pedicel, funicle joint 6 as long as 3, club nearly twice as long as funicle joint 6, three and one-half times as long as broad, funicle joint 2 seven times as long as broad.

Measurements in μ : Body, 920; thorax, 320; abdomen, 430; fore wing, length 810, width, 190; hind leg, 830. Antennae, lengths (widths) of joints : Scape, 85(31), pedicel, 52(31), funicular joints, 42(12), 87(12), 64(12), 47(17), 54(17), 64(21), club, 123(35).

Male: Colour of body dark brown, legs, scape, pedicel, all funicle joints and petiolus, yellow. Abdomen distinctly shorter than thorax, fore wing four times as long as broad (65 : 17). Antennae much longer than body, scape nearly as long as funicle joints, pedicel much shorter, funicle joints, 1 and 10 shorter than the remaining joints, funicle joints 2 to 5 a little longer than funicle joints 6 to 11, all funicle joints three to four times as long as broad.

Measurements in μ : Body, 830; thorax, 320; abdomen, 260; fore wing, length, 900, width, 230. Antennae, lengths (widths) of joints : Scape 94(35), pedicel 64(42), funicular joints, 83(33), 92(31), 92(31), 92(31), 94(28), 87(28), 87(26), 87(24), 87(28), 85(26), 87(26).

Locality: 1 female (holotype) and 1 male (allotype), Egypt, Dakhla Oasis, Gedida, 21.iii.1932, swept in orange grove, leg. H. Priesner.

Ogloblinlella aegyptiaca spec. nov.

(*Zentralbl. ges. Entom.*, Klagenfurt, 1946, I, 4).

Similar to *Ogloblinlella* (formerly *Mymar* Curt.) *pulchella* Hal., but differing in the antennae and wings.

Colour of body yellowish brown, eyes deep black, thorax and coxae more yellowish, antennae brown, wings brownish in distal half, colourless in proximal half. Head globular, eyes relatively very small, antennae inserted in the middle of head, vertex broad, ocelli in a low triangle; thorax as long as abdomen (20 : 21), but the latter broader, petiolate, petiolus one-half as long as abdomen (8 : 17), hind legs longer than body (80 : 61), hind coxae much longer than middle of fore coxae. Fore wing long petiolate, hind wings represented only by a bristle-like rudiment, petiolus of fore wing longer than blade of wing (37 : 30), the latter four times as long as broad (7 : 30), the whole wing nine times as long as broad (7 : 67), longest marginal cilia nearly as long as blade (26 : 30), nearly four times as long as greatest width of wing, no vein visible, anterior margin thickened, rudiment of hind wing two-thirds of length of fore wing. Antennae as long as body, with very fine hairs, scape and funicle joint 2 extremely long, much longer than club, scape four times as long as pedicel, the latter as long as funicle joint 1, funicle joint 2 nearly five times as long as 1, funicle joint 3 only one-half as funicle joint 1, funicle joint 4 a little longer than 3, funicle joint 5 somewhat longer than 4, 6 distinctly longer than 5, but shorter than pedicel, club nearly one-half as long as funicle joint 2.

Measurements in μ : Body, 840; horax, 280; abdomen, 290; petiolus, 110; fore wing, 920. Antennae, lengths (widths) of joints : Scape, 210(19), pedicel, 52(26), funicular joints, 52(12), 23(14), 26(14), 31(14), 33(14), 45(19), club, 130.

Locality : 1 female (holotype), Egypt, Giza, xi.1931, on *Panicum colonum*, leg. H. Priesner.

Host unknown.

Types and paratypes described in this paper are deposited in the collection of the Ministry of Agriculture, Cairo-Dokki, some paratypes are in the collection of the author.

A list of insects observed on economically important plants and plant products in Lebanon

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Due to the ever increasing proportions of the Lebanese exports of agricultural products to the countries of the Middle East, and due to the strict quarantine measures taken at the different ports of entry, a list of the pests already found in Lebanon will help quarantine officials to look for what they want to ban. Such pests as the San Jose' Scale and the Colorado Potato Beetle and other fearful ones do not exist in Lebanon as yet.

This list does not claim to be complete; it is rather a "first report" and more reports are likely to follow at irregular intervals. The species mentioned below are the results of sixteen years' observation mostly in areas of deciduous fruit-tree culture. Unless otherwise stated all specimens are in the author's collection. Many specimens had to be referred to competant specialists, and on this occasion the author expresses his gratitude to the Staffs of the British Museum of Natural History, the Commonwealth Institute of Entomology, the Deutsches Kolonial und Übersee-Museum in Bremen, the zoologisches Museum der Universität in Berlin, to Mr. E.P. Wiltshire, Dr. A. Diakonoff, Dr. H.G. Amsel, Mr. A. Alfieri, and to Prof. H. Najjar for allowing me to see his aphid collection.

Most species of Jassidae (Homoptera) were not determined due to difficult access to specialists. Mention of thrips is ommited altogether for the same reason. The Acarina were included due to their great importance.

Some species are very serious in a locality, but do not exist in another Or if they do they are not serious. A very serious pest is marked thus ***, a serious one **, and a pest which occasionally needs control by *. The name of a species not followed by an asterik means that the species did not reach the level of a pest.

I. INSECTS OF DECIDUOUS FRUIT TREES

Apple

Lepidoptera : 1. *Papilio podalirius* L. and f. *virgatus* Butl. (Papilionidae) ; 2. *Lymantria dispar* L. (Lymantriidae) ; 3. *Zeuzera pyrina* L. *** (Cossidae) ; 4. *Cossus ligniperda* L. * (Cossidae) ; 5. *Saturnia pyri* L. (Saturniidae) ; 6. *Acronicta rumiscis* L. (Noctuidae) ; 7. *Diloba caeruleocephala* L. (Noctuidae) ; 8. *Carpocapsa pomonella* L. and ssp. *putaminana* Stgr. *** (Tortricidae) ; 9. *Peronea* (*Acalla*) *variegana* Schiff. ** (Tortricidae) ; 10. *Argyroploce pruinana* Hb. * (Tortricidae) ; 11. *Cacoecia unifasciana* Dup. * (Tortricidae) ; 12. *Recurvaria nanella* Hb. (Gelechiidae) ; 13. *Tecmerium* (*Blastobasis*) *anthophagum* (Stgr.) (Gelechiidae) ; 14. *Tinea ankerella* Mann. (1) (Tineidae) ; 15. *Coleophora hemerobiella* Scop. (Elachistidae) ; 16. *Lyonetia clerkella* L. * (Lyonetiidae) ; 17. *Lythocolletis blancardella* F. (Gracilariidae). — Coleoptera : 18. *Coenorrhinus ruber* Fairm. * (Curculionidae) ; 19. *Anthonomus pomorum* L. ** (Curculionidae) ; 20. *Limobius borealis* Payk. (Curculionidae) ; 21. *Rhamphus pulicarius* Hbst. (Curculionidae) ; 22. *Tropiderinus interruptus* Reitter (Anthribidae) ; 23. *Carpophilus hemipterus* L., and 24. *Carpophilus* spec. (Nitidulidae) ; 25. *Capnodis ? tenebrionis* L. * (Buprestidae) ; 26. *Ptosima 11-maculata* Hbst. (Buprestidae) ; 27. *Perotis* (*Aurigena*) *chlorana* Cast. (Buprestidae) ; 28. *Polyphylla fullo* L. ** (Scarabaeidae) ; 29. *Tropinota squalida* Scop. (Scarabaeidae) ; 30. *Cantharis livida* L. (Cantharidae) ; 31. *Cantharis funebris* Mars. (Cantharidae) ; 32. *Malachius bipustulatus* L. (Malachiidae) ; 33. *Corticarina gibbosa* Hbst. (Lathridiidae) ; 34. *Longitarsus pellucidus* Foud. (Chrysomelidae) ; 35. *Cyaniris limbata* Stev. (Chrysomelidae) ; 36. *Cyaniris judaica* Lef. (Chrysomelidae) ; 37. *Scolytus rugulosus* Ratz. * (Scolytidae) — Diptera : 38. *Ceratitis capitata* Wied. * (Trypaneidae) ; 39. *Drosophila melanogaster* Meig. (*ampelophila* Lw.) (Drosophilidae) ; 40. ? *Scaptomyzella* spec. (Drosophilidae). — Hymenoptera : 41. *Arge cyanocrocea syriaca* Moes. (Tenthredinidae). — Orthoptera : 42. *Anacridium aegyptium* L. (Acrididae). — Hemiptera : 43. *Stephanitis* (*Tingis*) *pyri* F. (Tingidae) ; 44. *Eriosoma lanigera* Hausm. *** (Aphididae) ; 45. *Aphis pomi* De Geer ** (Aphididae) ; 46. *Aphis fabae* Scop. (Coll. Najjar) (Aphididae) ; 47. *Yezabura discrepans* Koch f. *malifoli* Mord. ** (Aphididae) ; 48. *Pterochlorus* (*Lachnus*) *persicae* (Chol.) (Aphididae) ; 49. *Aspidiotus hederae* Val. *** (Coccidae) ; 50. *Parlatoria oleae* Ldgr. (Coccidae) ; 51. *Lecanium ? corni*

(1) In my paper « The Insect Fauna supported by the Apple and Pear Trees in Lebanon » (*Ent. Rec.*, LIII, pp. 125-128, 1941), the name *Borkhausenia formosella.* was mentioned by mistake instead of *Tinea ankerella* Mann.

Bché (Coccidae). — Acarina : 52. *Eotetranychus telarius* L. (Tetranychidae) ; *Brevipalpus pyri* Sayed (Tetrapoda).

Pear

Lepidoptera : 1. *Papilio podalirius* L. and f. *virgatus* Butl. (Papilionidae) ; 2. *Saturnia pyri* L. * (Saturniidae) ; 3. *Zeuzera pyrina* L. *** (Cossidae) ; 4. *Lymantria dispar* L. (Lymantriidae) ; 5. *Aegeria myopaeformis* Bkh. (Sesiidae) ; 6. *Carpocapsa pomonella* L. *** (Tortricidae) ; 7. *Peronea (Acalla) variegana* Schiff. (Tortricidae) ; 8. *Blastodacna libanotica* Dkff. (Elachistidae) ; 9. *Lihtocolletis blanchardella* F. (Gracilariidae) ; 10. *Nepticula* spec. (Nepticulidae) ; 11. *Bucculatrix* spec. (Lyonetiidae). — Coleoptera : 12. *Rhynchites splendidus* Kryn. (=*schilskyi* Voss i.l.) * (Curculionidae) ; 13. *Magdalis cerasi* L. (Curculionidae) ; 14. *Apion (Catapion)* propre *seniculus* Kirby (Curculionidae) ; 15. *Carpophilus hemipterus* L. (Nitidulidae) ; 16. *Tropinota squalida* Scop. * (Scarabaeidae) ; 17. *Polyphylla fullo* L. ** (Scarabaeidae) ; 18. *Cyniaris limbata* Stev. (Chrysomelidae) ; 19. *Malachius bipustulatus* L. * (Malachiidae) ; 20. *Capnodis ? tenebrionis* L. (Buprestidae) ; 21. *Scolytus rugulosus* Ratz. (Scolytidae). — Hemiptera : 22. *Stephanitis (Tingis) piri* F. * (Tingidae) ; 23. *Monosteira lobulifera* Reut. (Tingidae) ; 24. *Psylla pyricola* Forst. *** (Psyllidae) ; 25. *Aspidiotus hederae* Val. ** (Coccidae) ; 26. *Ceroplastes rusci* L. (Coccidae) ; 27. *Eulecanium corni* Bché (Coccidae) ; 28. *Parlatoria oleae* Ldgr. (Coccidae) ; 29. *Icerya purchasi* Mask. (Coccidae) ; 30. *? Trialeurodes vaporarium* West. (Aleurodidae) ; 31. *Aphis fabae* Scop. (Najjar) (Aphididae) ; 32. *Aphis pomi* De Geer (Aphididae) ; 33. *Phylloxera ? pyri* Chol. (Aphididae). — Hymenoptera : 34. *Eriocampoides limacina* Konow (Tenthredinidae) ; 35. *Cymbex quadrimaculatus humeralis* (Tenthredinidae) ; 36. *Arge cyanocrocea syriaca* Moes. (Tenthredinidae). — Diptera : 37. *Drosophila melanogaster* Meig. (Drosophilidae) ; 38. *Ceratitis capitata* Wied. *** (Trypaneidae) ; 39. *Apiomyia bergenstammi* Wachtl. *** (Cecidomyidae). — Acarina : 40. *Eriophyes pyri* Pagst. (Eriophyidae).

Quince, Hawthorn and Jujube

Lepidoptera : 1. *Zeuzera pyrina* L. *** (Cossidae) ; 2. *Argyroploce variegana* Hb. * (Tortricidae), not on jujube ; 3. *Recurvaria nanella* Hb. *** (Gelechiidae), on quince ; 4. *Carpocapsa pomonella* L. *** (Tortricidae), on quince ; 5. *Pagyda traducalis* Zell. (Pyralidae), on jujube. — Diptera : 6. *Carpomyia vesuviana* Costa *** (Trypaneidae), on jujube. — Coleoptera : 7. *Tropinota squalida* Scop. (Scarabaeidae) ; 8. *Polyphilla fullo* L. ** (Scarabaeidae). — Hemiptera : 9. *Yezabura ? crataegi* (Walt.) (Aphi-

didae), on hawthorn ; 10. *Idiocerus* spec. (Jassidae), on hawthorn ; 11. *? Trialeurodes vaporarium* West. (Aleurodidae), on hawthorn.

Plum and Prune

Lepidoptera : 1. *Saturnia pyri* L. (Saturniidae) ; 2. *Argyroploce variegana* Hb. (Tortricidae) ; 3. *Carpocapsa pomonella* L. * (Tortricidae) ; 4. *Lyonetia clerckella* L. (Lyonetiidae) ; 5. *Lasiocampa ? grandis* Rog. (Lasiocampidae) ; 6. *Coleophora hemerobiella* Scop. (Elachistidae). — Hymenoptera : 7. *Hoplocampa flava* L. *** (Tenthredinidae) ; 8. *Eriocampoides limacina* Konow (Tenthredinidae). — Coleoptera : 9. *Scolytus rugulosus* Ratz. ** (Scolytidae) ; 10. *Scolytus amygdali* Guér. * (Scolytidae) ; 11. *Cerambyx dux* Falt. ** (Cerambycidae) ; 12. *Sinoxylon perforans* Schrank (Bostrychidae) ; 13. *Capnodis tenebrionis* L. *** (Buprestidae) ; 14. *Ptosima 11-maculata* Herbst. (Buprestidae) ; 15. *Perotis* (*Aurigena*) *chlorana* Cast. (Buprestidae) ; 16. *Orsodacne variabilis* Baly (Chrysomelidae) ; 17. *Rhynchites praestus* Boh. (Curculionidae) ; 18. *Polyphilla fullo* L. ** (Scarabaeidae). — Hemiptera : 19. *Pterochlorus* (*Lachnus*) *persicae* (Chol.) ** (Aphididae) ; 20. *Brachycaudus helichrysi* (Kalt.) ** (Aphididae) ; 21. *Eulecanium corni* Bché (Coccidae) ; 22. *Eulecanium prunastri* (Fonsc.) (Coccidae). — Diptera : 23. *Ceratitis capitata* Wied. * (Trypaneidae) ; 24. *Drosophila melanogaster* Meig. (Drosophilidae). — Acarina : an Eriophyid.

Apricot and Peach

Lepidoptera : 1. *Cossus ligniperda* L. ** (Cossidae), on apricot ; 2. *Anarsia lineatella* Zell. ** (Gelechiidae), on apricot ; 3. *Carpocapsa pomonella* L. ** (Torticidae) ; 4. *Argyroploce variegana* Hb. (Torticidae) ; 5. *Lyonetia clerckella* L. (Lyonetiidae) ; 6. *Micropteryx* spec. (Micropterygidae). — Coleoptera : 7. *Capnodis tenebrionis* L. *** (Buprestidae) ; 8. *Ptosima 11-maculata* Herbst. (Buprestidae) ; 9. *Cerambyx dux* Falt. ** (Cerambycidae) ; 10. *Rhynchites trojanus* Gyll. ** (Curculionidae), on apricot ; 11. *Anthonomus cyprius* Marsh. * (Curculionidae), on peach ; 12. *Lixus elongatus* Goeze (= *filiformis* Fabr.) (Curculionidae), on peach ; 13. *Carpophilus hemipterus* L. (Nitidulidae) ; 14. *Scolytus rugulosus* Ratz. ** (Scolytidae). — Diptera : 15. *Ceratitis capitata* Wied. *** (Trypaneidae) ; 16. *Drosophila melanogaster* Meig. (Drosophilidae). — Hemiptera : 17. *Pterochlorus* (*Lachnus*) *persicae* Chol. *** (Aphididae), on peach ; 18. *Brachycaudus helichrysi* (Walt.) (Aphididae), on peach.

Cherry

Coleoptera : 1. *Capnodis tenebrionis* L. ** (Buprestidae) ; 2. *Polyphila fullo* L. ** (Scarabaeidae) ; 3. *Scolytus rugulosus* Ratz. ** (Scoly-

tidae) ; 4. *Tropiderinus interruptus* Reitter (Anthribidae). — Hymenoptera : 5. *Eriocampoides limacina* Konow (Tenthredinidae). — Hemiptera : 6. *Spilostethus pandurus* (Scop.) (Lygaeidae) ; 7. *Pterochlorus* (*Lachnus*) *persicae* Chol. (Aphididae).

Almond

Lepidoptera : 1. *Cossus ligniperda* L. * (Cossidae) ; 2. *Zeuzera pyrina* L. ** (Cossidae). — Coleoptera : 3. *Capnodis tenebrionis* L. *** (Buprestidae) ; 4. *Cerambyx dux* Falt. ** (Cerambycidae). — Hymenoptera : 5. *Eurytoma amygdali* End. ** (Chalcididae) ; 6. *Cymbex quadrimaculatus humeralis* Müll. *** (Tenthredinidae). — Hemiptera : 7. *Pterochlorus* (*Lachnus*) *persicae* Chol. ** (Aphididae) ; 8. *Brachycaudus helichrysi* (Kalt.) * (Aphididae). — Acarina : *Eriophyes* spec. *** (Eriophyidae).

Pomegranate

Lepidoptera : 1. *Zeuzera pyrina* L. ** (Cossidae) ; 2. *Deudorix livia* Klug ** (Lycaenidae). — Hemiptera : 3. *Aphis gossypii* Glover * (Najjar) (Aphididae).

Fig

Lepidoptera : 1. *Simaethis nemorana* Hb. (Glyphipterigidae). — Coleoptera : 2. *Hypoborus ficus* Er. (Scolytidae) ; 3. *Apion* spec. (Curculionidae). — Diptera : 4. *Lonchaea aristella* Becker ** (Sapromyzidae). — Hemiptera : 5. *Ceropastes rusci* L. ** (Coccidae) ; 6. *Homotoma ficus* Guér. (Psyllidae).

Grape Vine

Lepidoptera : 1. *Celerio lineata livornica* Esp. (Sphingidae) ; 2. *Theretra alecto cretica* Boisd. (Sphingidae) ; 3. *Hippotion celerio* L. (Sphingidae) ; 4. *Pterogon proserpina* Pall. (Sphingidae) ; 5. *Procris ampelophaga* Bayle ** (Zygaenidae) ; 6. *Polychrosis botrana* Schiff. ** (Tortricidae). — Coleoptera : 7. *Eptacus arachniformis* Reitter ** (Curculionidae). — Hemiptera : 8. *Phylloxera vastatrix* Fitch. *** (Aphididae) ; 9. *Pseudococcus vitis* Niet. * (Coccidae). — Acarina : *Eriophyes vitis* Pang. * (Eriophyidae).

II. INSECTS OF FRUIT TREES WITH PERSISTANT FOLIAGE

Citrus

Diptera : 1. *Ceratitis capitata* Wied. *** (Trypaneidae) ; 2. *Drosophila melanogaster* Meig. (Drosophilidae). — Hemiptera : 3. *Dionconotus cruentatus* Brullé * (Capsidae) ; 4. *Toxoptera aurantii* Koch * (Aphidi-

dae); 5. *Chrysomphalus aonidum* L. (=*ficus* Ashm.) *** (Coccidae); 6. *Aonidiella aurantii* Mask. ** (Coccidae); 7. *Aspidiotus hederae* Vall. ** (Coccidae); 8. *Lepidosaphes citricola* Pack. *** (Coccidae); 9. *Ceroplastes floridensis* Comst. * (Coccidae); 10. *Pseudococcus citri* Risso * (Coccidae); 11. *Icerya purchasi* Mask. ** (Coccidae).

Olive

Lepidoptera: 1. *Zeuzera pyrina* L. ** (Cossidae); 2. *Glyphodes unionalis* Hb. (Pyralidae). — Coleoptera: 3. *Coenorrhinus ruber* Fairm. (Curculionidae); 4. *Phloeotribus scarabaeoides* Bern. (=*oleae* Fab.) ** (Scolytidae). — Diptera: 5. *Dacus oleae* Rossi *** (Trypaneidae); 6. *Perrissia oleae* Loew (Cecidomyidae). — Hemiptera: 7. *Aspidiotus hederae* Vall. * (Coccidae); 8. *Lepidosaphes ?palaestinensis* Bod. (Coccidae); 9. *Saissetia oleae* Bern. (Coccidae); 10. *Euphyllura olivina* (Costa) * (Psyllidae).

III. INSECTS OF BROAD-LEAVED FOREST TREES

Oak

Lepidoptera: 1. *Eriogaster philippsi* Bart. * (Lasiocampidae); 2. *Pachypasa otus* Drury (Lasiocampidae); 3. *Lymantria dispar* L. (Lymantriidae); 4. *Smerinthus quercus* Schiff. (Sphingidae); 5. *Thecla illicis* Esp. (Lycaenidae); 6. *Spatalia argentina* Schiff. (Notodontidae); 7. *Hoplitis (Hybocampa) milhauseri* F. (Notodontidae); 8. *Phalera bucephaloides syriaca* Zy. (Notodontidae); 9. *Drymonia querna* F. (Notodontidae); 10. *Dryobota roboris* Boisd. (Noctuidae); 11. *Drybotodes protea* Esp. (Noctuidae); 12. *Boarmia rhomboidaria* Schiff. (Geometridae); 13. *Eupithecia quercaria* Prout (Wiltshire) (Geometridae); 14. *Cosymbia pupillaria* Hb. (Geometridae); 15. *Tischeria complanella* Hb. ** (Gracilariidae); 16. *Lithocolletis quercus* Amsel (Gracilariidae); 17. *Laspeyresia amplana* Hb. (Tortricidae); 18. *Carcina quercana* F. (Gelechiidae). — Coleoptera: 19. *Curculio (Balaninus) elephas* Gyll. ** (Curculionidae); 20. *Apion (Aspidapion) radiolus* Kirby (Curculionidae); 21. *Sinoxylon perforans* Schrank (Bostrychidae); 22. *? Purpuricenus dalmaticus* Sturm. (Cerambycidae). — Hymenoptera: 23. *Andricus* spec. (Cynipidae); 24. *Plagiotrochus ilicis* (Fabr.) (Cynipidae). — Hemiptera: 25. *Kermes ilicis* (L.) (Coccidae); 26. *Asterolecanium variolosum* Ratz. (Coccidae); 27. *Lachnus longipes* (Aphididae); 28. *Phylloxera valentina* (Aphididae). — Acarina: 29. *Eriophyes ilicis* (Eriophyidae).

Pistacio spp.

Lepidoptera: 1. *Pachypasa otus* Drury (Lasiocampidae); 2. *Eutelia adulatrix* Hübn. (Noctuidae); 3. *Lobophora externata* H.-S. (Geometridae);

4. *Eupithecia dodoneata dubiosa* Dietze (Geometridae). — Hemiptera : 5. *Baizongia pistacia* ** (Aphididae) ; 6. *Geoica utricularia* Pass. ** (Aphididae) ; 7. *Forda* spec. (Aphididae) ; 8. *Melanaspis inopinata* (Leon.) ** (Coccidae) ; 9. *Ceroplastes floridensis* Comst. (Coccidae) ; 10. *Aspidiotus hederae* Vall. ** (Coccidae).

IV. INSECTS OF CONIFEROUS FOREST TREES

Pinus, Sequoia, Cupressus, etc.

Lepidoptera : 1. *Thaumetopoea wilkinsoni* Tams ** (Thaumetopoedae) ; 2. *Thaumetopoea solitaria* Freyer (Wiltshire) (Thaumetopoedae) ; 3. *Evetria buoliana* Schiff. ** (Tortricidae). — Hemiptera : 4. *Cinara pinihabitans* (Mord.) (Najjar) (Aphididae) ; 5. *Leucaspis ?pini* (Hartig) (Coccidae) ; 6. *Carulaspis visci* (Schr.) (Coccidae).

Vegetable Crops

Lepidoptera : 1. *Pieris brassicae* L. ** (Pieridae) ; 2. *Pieris rapae* L. * (Pieridae) ; 3. *Mamestra brassicae* L. ** (Noctuidae) ; 4. *Agrotis* spec. (Noctuidae) ; 5. *Plutella maculipennis* Curt. ** (Plutellidae). — Coleoptera : 6. *Phyllotreta atra cruciferae* Goeze *** (Chrysomelidae). — Hemiptera : 7. *Eurydema festivum* L. (= *pictum* (H.S.)) *** (Pentatomidae) ; 8. *Eurydema festivum decoratum* (H.S.) *** (Pentatomidae) ; 9. *Eurydema rugulosum* Dhrm. * (Pentatomidae) ; 10. *Nezara viridula* (L.) ** (Pentatomidae) ; 11. *Brevicoryne brassicae* L. *** (Aphididae). — 12. Nematodeae : *Heterodera* spec. (Anguillulidae).

Solanaceae

Lepidoptera : 1. *Acherontia atropos* L. (Spingidae) ; 2. *Lampra (Triphaena) pronuba* L. ** (Noctuidae) ; 3. *Agrotis segetum* Schiff. ** (Noctuidae) ; *Euxoa* spec. (Noctuidae) ; 5. *Phytometra chalcites* Esp. ** (Noctuidae). — Orthoptera : 6. *Gryllotalpa vulgaris* L. *** (Gryllotalpidae). — Hemiptera : 7. *Chlorita ?signata* ** (Jassidae) ; 8. *Myzus persicae* Sulz., on tobacco (Najjar) (Aphididae). — Acarina : 9. *Phyllocoptes destructor* (Niefer) *** (Eriophyidae) ; 10. *Eotetranychus telarius* (L.) ** (Tetranychidae).

Cucurbitaceae

Diptera : 1. *Myopardalis pardalina* Big. *** (Trypaneidae) ; 2. *Drosophila melanogaster* Meig. (Drosophilidae). — Hymenoptera : 3. *Messor* spec. (Formicoidea). — Hemiptera : 4. *Aphis frangulae* Kalt. *** (Aphididae).

Leguminosae

Lepidoptera : 1. *Cosmolyce baeticus* L. *** (Lycaenidae). — Coleoptera : 2. *Bruchus ervi* Fröl. ** (Bruchidae) ; 3. *Bruchus pisorum* L. *** (Bruchidae) ; 4. *Bruchus rufimanus* Boh. ** (Bruchidae) ; 5. *Bruchus* spec. (Bruchidae) ; 6. *Apion punctigerum* Payk. (Curculionidae) ; 7. *Sitona lineata* L. ** (Curculionidae) ; 8. *Phytonomus* (*Dapalinus*) *striatus* Boh. (= *subvittatus* Cap.) (Curculionidae) ; 9. *Phytonomus* (s. str.) *aegyptiacus* Cap. *** (Curculionidae). — Diptera : 10. Leaf miner (Cecidomyidae). — Hemiptera : 11. *Aphis fabae* Scop. ** (Aphididae) ; 12. *Macrosiphum pisi* Theob. (Aphididae).

Artichoke

Coleoptera : 1. *Cassida palaestina* Reiche ** (Chrysomelidae) ; 2. *Cassida* spec. (Chrysomelidae). — Diptera : 3. Leaf miner (Cecidomyidae). — Hemiptera : 4. *Tettigometra* spec. (Tettigometridae) ; 5. *Brachycaudus cardui* L. *** (Aphididae).

VI. INSECTS IN GRAMINEAE

Wheat and Barley

Lepidoptera : 1. *Syringopais* (*Scythris*) *temperatella* Ld. ** (Elachistidae). — Coleoptera : 2. *Marseulia dilativentris* Reiche (Chrysomelidae) ; 3. *Chaetocnema* spec. (Chrysomelidae). — Hemiptera : 4. *Eurygaster integriceps* Put. *** (Pentatomidae) ; 5. *Triecphora sanguinolenta* L. (Cicadidae) ; 6. *Thamnotettix prasinus* Fall. (Jassidae) ; 7. *Tettigometra* spec. ** (Tettigometridae) ; 8. *Macrosiphum dirhodum* (Walk.) (Aphididae) ; 9. *Macrosiphum ? granarium* (Kirby) (Aphididae).

Maize and Sorghum

Lepidoptera : 1. *Lampra* (*Triphaena*) *pronuba* L. ** (Noctuidae) ; 2. *Agrotis segetum* Schiff. ** (Noctuidae) ; 3. *Phytometra gamma* L. ** (Noctuidae) ; 4. *Pyrausta nubilalis* Hb. * (Pyralidae). — Coleoptera : 5. *Chaetocnema chlorophana* Duft. (Chrysomelidae). — Hymenoptera : 6. *Formica* spec. ** (Formicoidea). — Hemiptera : 7. *Thamnotettix* spec. (Jassidae) ; 8. *Aphis maidis* Fitch ** (Aphididae).

Stored Food Products

Lepidoptera : 1. *Ephestia cautella* Wlk. ** (Pyralidae) ; 2. *Ephestia kuehniella* Z. ** (Pyralidae) ; 3. *Plodia interpunctella* Hb. ** (Pyralidae) ; 4. *Pyralis farinalis* L. ** (Pyralidae) ; 5. *Sitotroga cerealella* Oliv. ** (Gelechiidae) ; 6. *Tinea granella* L. *** (Tineidae). — Coleoptera : 7.

Carpophilus hemipterus L. ** (Nitidulidae) ; 8. *Oryzaephilus surinamensis* L. ** (Cucujidae) ; 9. *Tenebroides mauritanicus* L. (Trogositidae) ; 10. *Tribolium (Stene) confusum* Duv. * (Tenebrionidae) ; 11. *Tribolium* (s.str.) *castaneum* Hbst. ** (Tenebrionidae) ; 12. *Calandra granaria* L. ** (Curculionidae) ; 13. *Calandra oryzae* L. *** (Curculionidae) ; 14. *Bruchus rufimanus* Boh. ** (Bruchidae) ; 15. *Bruchus ervi* Fröl. ** (Bruchidae) ; 16. *Bruchus pisorum* L. (Bruchidae).

Neue Hemiptera-Heteroptera aus Nordafrika

(mit 4 Textfiguren)

von Eduard Wagner, Hamburg

1. Coranus espanoli nov. spec.

Schwarz, matt, mit langen, graugelben borstenartigen Haaren bedeckt, aber ohne filzige Behaarung.

Kopf von oben gesehen (Fig. 1B) sehr lang und schmal, hinter den Augen parallelseitig und am Grunde halsartig abgesetzt. Der gewölbte vordere Teil reicht bis etwas über die Augen hinaus und ist dort durch eine tiefe, halbkreisförmige Querfurche begrenzt. Der Teil des Kopfes vor den Augen ist auffallend lang, etwas länger als der Teil hinter den Augen und etwas weniger als 1,5 mal so lang wie breit. Scheitel etwa 3 mal so breit wie das flache Auge. Kopf schwarz, hinterer Teil mit gelber Mittellinie, Innenrand der Augen mit schmalem gelbem Streif, der sich auf dem hinteren Teile des Kopfes fortsetzt. Fühler schwarzbraun bis schwarz. Zwischenglied auffallend lang, etwa halb so lang wie der Scheitel breit ist. Glied 1 schlank, 0,75 mal so lang wie der Kopf und 1,56 mal so lang wie der Kopf samt Augen breit ist; Glied 2+3 zusammen so lang wie das 1., das 2. Glied 1,5 mal so lang wie das 3., Glied 4 so lang wie das 1. Glied. Pronotum deutlich zweiteilig, die Höcker an den Vorderecken schmal, gelblich; vorderer Teil in der Mitte mit tiefer Längsfurche; beiderseits derselben eine kleine Grube. Hinterer Teil mit gerundeten Seiten, der Rand im hinteren Teile leicht ausgebreitet. Scutellum kurz, mit gelber Mittellinie und gelber, nach hinten gerichteter, nicht aufgerichteter Spitze. Halbdecken der f. brach. (♀) klein, nur bis zum Ende des 1. Hinterleibsegmentes reichend, ohne Membran, der f. makr. (♂) das Hinterleibsende überragend; Corium schwarzbraun, einfarbig; Membran gross, dunkel rauchbraun, mit 2 grossen Zellen, die etwa bis zur Mitte reichen, von der äusseren Zelle führt eine Ader bis zum Hinterrande der Membran. Fläche der Membran wellenartig chagriniert. Beine schwarzbraun bis schwarz; Schenkel und

Schienen an der Aussenkante mit gelbem Längsstreif (an Mittel- und Hinterschienen bisweilen fehlend); Tarsen und Klauen schwarzbraun. Unterseite schwarz, glänzend, nur zerstreut behaart. Schnabel schwarz, bis zu den Vorderhüften reichend; sein 1. Glied erreicht nicht ganz die Mitte

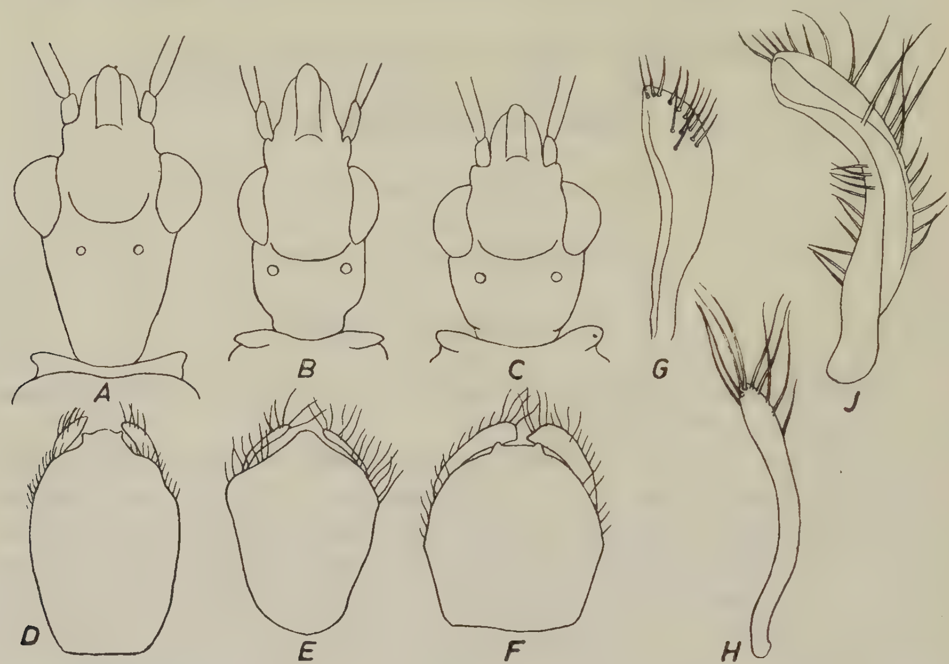

Fig. 1 : Kopf von oben von (A) *Coranus subapterus* Deg. ♂, (B) *Coranus espanoli* nov. spec., (C) *Coranus aegyptius* F.; Genitalsegment des ♂ von (D) *Coranus subapterus* Deg., (E) *Coranus espagnoli* nov. spec., (F) *Coranus aegyptius* F.; Genitalgriffel von (G) *Coranus subapterus* Deg., (H) *Coranus espagnoli* nov. spec., (J) *Coranus aegyptius* F.

des Auges. Genitalsegment des ♂ (Fig. 1 E) verhältnismässig kurz, im distalen Drittel stark verbreitert, fast eckig, die Seiten vor und hinter der breitesten Stelle fast gerade, der distale Höcker ist klein und glatt und trägt weder Zähne noch Höckerchen. Genitalgriffel (Fig. 1H) auffallend lang und schmal, fast überall gleich breit, distal gerundet und mit langen, kräftigen Borsten besetzt. Analsegment des ♀ fast halbkugelig gewölbt; Analöffnung in der Mitte, über ihr beiderseits ein flaches Grübchen und unter ihr jederseits ein undeutlicher Höcker.

Länge (♂) 9.7 mm., (♀) 9.85 mm.

C. espanoli nov. spec. unterscheidet sich von allen übrigen Arten durch den Bau des Kopfes, dessen Teil vor den Augen fast 1.5 mal so breit wie lang ist und dessen Seiten hinter den Augen gerade und parallel sind (Fig. 1B). Er steht zweifellos *C. aegyptius* F. am nächsten; jedoch ist bei letz-

terer Art der Kopf viel kürzer (Fig. 1 C) und hat gerundete Seiten. Bei allen übrigen Arten der Gattung ist der Kopf hinter den Augen kegelförmig verjüngt (wie Fig. 1 A). Auch durch die nicht aufgerichtete Scutellumspitze zeigt sich unsere neue Art als mit *C. aegyptius* F. verwandt; jedoch fehlt ihr die dichte graugelbe filzige Behaarung dieser Art. Der auffallend lange, schlanke Genitalgriffel (Fig. 1 H-J) trennt die Art ebenfalls von allen übrigen.

1 ♂, 1 ♀ Yebel Dersa (El Haus Yebele), Spanisch Marokko, v.41, E. Morales leg.

Ich widme diese interessante Art. Herrn Prof. Español, Barcelona, dem ich bereits viele interessante Arten aus dem westlichen Mittelmeergebeit verdanke.

Holotype in meiner Sammlung, Paratypoid im Museo de Ciencias Naturales, Barcelona.

2. Dicranocephalus moralesi nov. spec.

Gross, von länglicher Gestalt, graubraun gefärbt und gleichmässig dunkel punktiert. Ober- und Unterseite mit schrägstehenden Haaren, die überall mindestens so lang sind wie das 2. Fühlerglied dick ist. Die Be-

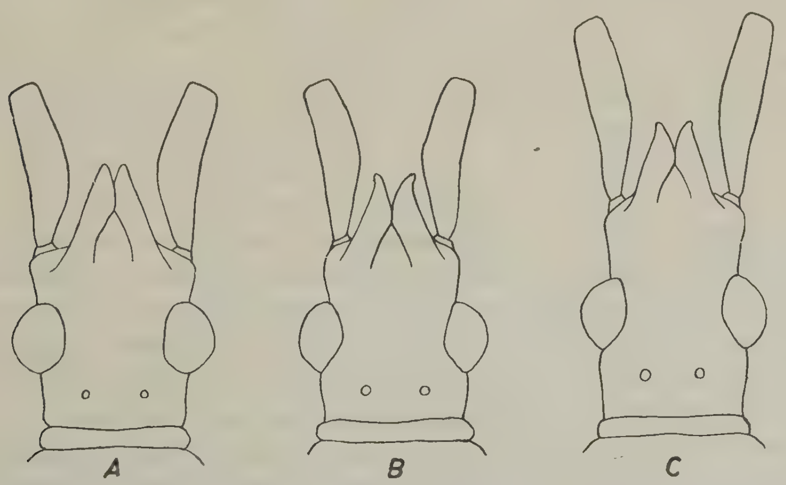

Fig. 2 : Kopf des ♀ von oben von (A) *Dicranocephalus moralesi* nov. spec., (B) *Dicranocephalus agilis* Scop., (C) *Dicranocephalus setulosus* Ferr.

haarung der Oberseite etwas kräftiger und dunkler als die der Unterseite. Kopf schwarz, vor den Augen breiter des hinter denselben, Spitzen der Wangen verhältnismässig lang, abgerundet, aber an der Spitze kaum divergierend (Fig. 2 A), Scheitel doppelt so breit wie das grosse, runde Auge.

Fühler lang, mit Ausnahme von Glied 4 überall dicht behaart; die Haare stehen schräg und sind zum Teil länger als das 2. Glied dick ist; Glied 1 schwarz, leicht gekrümmt, dick, etwas länger als der Kopf vor den Augen; Glied 2 etwa 1,1 mal so lang wie der Kopf, schwarz, mit 2 gelben Ringen, die schmaler sind als ihr Zwischenraum; Glied 3 etwa 0,6 mal so lang wie das 2., schwarz, das basale Drittel gelb; Glied 4 schwarzbraun, glatt, mit nur wenigen, zerstreuten Haaren, etwas länger (1.05 mal so lang) wie das 2., am Grunde bis etwa 1/6 der Länge gelb. Pronotum trapezförmig, hinter dem Vorderande eine breite, schwarze Querbinde. Scutellum etwa gleichseitig dreieckig, mit schlanker, verlängerter, schwielenartiger, gelber Spitze. Halbdecken den Hinterleib etwas überragend. Membran dunkel rauchbraun, zwischen den Adern mit kleinen Tuberkeln. Beine schlank, sehr lang und fein behaart. Schenkel gelb, Hinterschenkel fast bis zur Hälfte schwarz. Schienen gelb, ihre Behaarung ist auffallend dicht und zum Teil länger als die Schiene dick ist; Grund und Spitze der Schienen und Tarsen schwarz. Connexivum schwarz, kahl, auf jedem Segment ein gelber Fleck. Der gelbe 1 ♀ aus Spanish Marokko (Isaguën), vi.41, E. Morales leg.

Länge (♀) 14,4 mm.

1 ♀ aus Spanisch Marokko (Isaguën), vi.41, E. Morales leg.

Holotype im Museo de Ciencias Naturales, Barcelona.

D. moralesi ist in Gestalt und Grösse *D. agilis* Scop. sehr ähnlich, unterscheidet sich aber von dieser Art durch die dichte, lange Behaarung, die vor allem an Beinen und Fühlern auffällt. Der Kopf ist bei *D. agilis* vor den Augen schmaler als hinter denselben und der Scheitel breiter (♀ = 2,2 mal so breit wie das weit flachere Auge; Fig. 2 B); die Spitzen der Wangen sind kürzer, divergieren aber stärker und stehen daher distal weiter auseinander; die Schildspitze ist nicht verlängert und der schwarzgefärbte Teil der Hinterschenkel ist kürzer. Durch die Länge der Behaarung steht die Art auch *D. setulosus* Ferr. nahe. Bei letzterer Art ist jedoch die Behaarung der Fühler und Beine noch länger, feiner und heller und die längeren Haare pflegen an den Fühlern senkrecht zu stehen. Der Kopf ist länger und schlanker und gleichfalls vor den Augen schmaler als hinter denselben; die Wangen sind gleichfalls kürzer und breiter und ihre Spitzen divergieren stärker (Fig. 2 C). Die Art ist überdies heller gefärbt und der schwarze Teil der Hinterschenkel ist noch kürzer als bei *D. agilis*. Von allen übrigen Arten der Gattung ist die Art leicht durch die auffallende Behaarung zu trennen.

3. Melanocoryphus albomaculatus Gz. subfasciatus nov. var.

Discoidalfleck des Corium stark vergrössert, den Raum zwischen Cubital, und Brachialader nach innen etwas überschreitend, nach aussen

durch eine bindenartige Verlängerung den Aussenrand erreichend; letztere unscharf begrenzt. Die Membran zeigt nur den runden weissen Discoidalfleck,

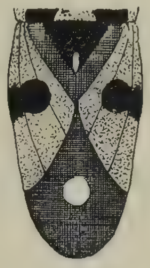

Fig. 3 : *Melanocoryphus albomaculatus* Gz. *subfasciatus* nov. var.

die übrigen Flecke fehlen. Behaarung der Oberseite kürzer und feiner; sonst wie die Stammform. Es ist nicht ausgeschlossen, dass hier eine neue Art vorliegt.

1 ♀, Spanisch Marokko (Y Lechchab, 2000 m.), 21.vi.41, E. Morales leg.

Holotype im Museo di Ciencias Naturales, Barcelona.

4. Tuponia guttata nov. spec.

Hell weisslichgrün, mit dunkelgrünen Flecken und feiner blassgelber Behaarung. Das ♂ langgestreckt (Fig. 4 A), das ♀ länglich oval (Fig. 4 B). Kopf kurz, stark geneigt, gelblich, ungefleckt. Scheitel beim ♂ 1,35 ×, beim ♀ 2 × so breit wie das etwas gewölbte Auge, das beim ♂ etwas über die Scheitellinie emporragt. Auge dunkel graugrün bis graubraun. Fühler hell weisslichgelb; das 1. Glied kräftig 0,67-0,75 × so lang wie der Scheitel breit ist; Glied 2 stabförmig, beim ♂ so lang, beim ♀ 0,85 × so lang wie das Pronotum hinten breit ist; Glied 3 nur 0,5-0,6 × so lang wie das 2., das 4. Glied 0,55 × so lang wie das 3.

Pronotum gelblich, im hinteren Teile grün gefleckt oder ganz grün, am Hinterrand beim ♂ 1,2 ×, beim ♀ 1,33 × so breit wie der Kopf samt Augen. Schildchen gelblichgrün bis grün. Halbdecken weisslich, dicht mit dunkelgrünen rundlichen Flecken bedeckt, die einen Fleck in der Mitte des Clavus, den Aussenrand des Corium mit Ausnahme der Spitze und einen seitlichen Fleck in der Mitte des Corium freilassen. Bisweilen sind die grünen Flecke zu einer gleichmässigen Fläche vereinigt. Cuneus weisslich, am Aussen- und Innenrand ein grüner Streif, bisweilen auch die Mitte grün gefleckt. Membran rauchgrau, die kleinere Zelle ganz und die grössere am Ende dunkel. Neben der Cuneusspitze ein heller Fleck und dahinter ein

dunkler. Membran den Hinterleib beim ♂ mit ihrer ganzen Länge, beim ♀ mit der Hälfte ihrer Länge überragend. Unterseite grünlich, hinterer Rand der Segmente weiss.

B e i n e gelb; Schenkel grün gefleckt. Schienen mit schwarzen Dornen, aber ohne schwarze Punkte. Spitze des 3. Tarsengliedes und Klauen schwarz. Der weissgelbe Schnabel hat eine schwarze Spitze und reicht bis etwas über die Mittelhüften hinaus.

Genitalsegment des ♂ (Fig. 4 C) kegelförmig, am Grunde verhältnismässig breit. Rechter Genitalgriffel des ♂ (Fig. 4 E) dünn, hautartig,

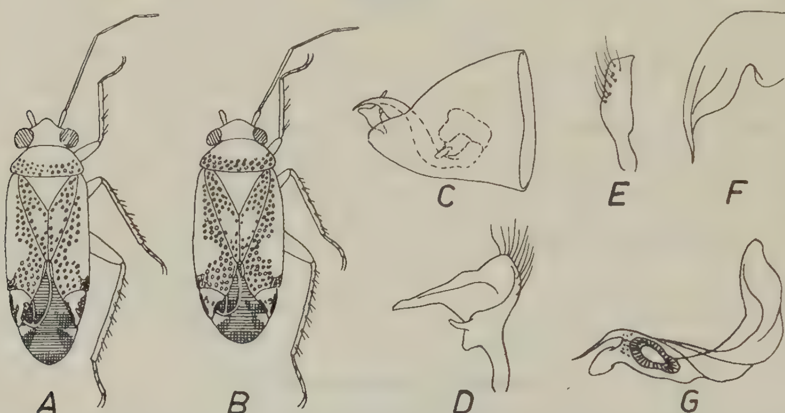

Fig. 4 : *Tuponia guttata* nov. spec. (A) Männchen, (B) Weibchen, (C) Genitalsegment (seitlich), (D) Linker Griffel, (E) Rechter Griffel, (F) Theca, (G) Spitzenteil des Penis (Vesika).

schmal, fast parallelseitig, mit undeutlicher Hypophysis. Linker Griffel (Fig. 4 D) mit langer, spitzer Hypophysis, auf dem Sinneshöcker ein kurzer, gekrümmter Fortsatz. Theca (Fig. 4F) in eine lange, feine Spitze ausgezogen, hinter derselben plötzlich verbreitert. Penis (Fig. 4 G) kurz und kräftig, stark gewunden, distal mit feiner, langer Spitze; daneben ein blattartiger Fortsatz; sekundäre Gonopore gross, nahe der Spitze gelegen.

Länge (♂) 2,9-3,1 mm., (♀) 2,6-2,8 mm.

Ich sah 2 ♂♂ und 5 ♀♀ aus Aegypten (Cairo, 31.x.15, Sidi Gaber, 30.x.24, und Marg, 7.ii. und 21.iii.13).

H o l o t y p e im Ministry of Agriculture, Entomological Section, Kairo. P a r a t y p e n ebenda und in meiner Sammlung.

Die Art lebt an Tamarisken.

T. guttata nov. spec. ist *T. concinna* Reut. und *T. conspersa* Reut. in der Zeichnung sehr ähnlich, unterscheidet sich aber von beiden durch grössere Gestalt, schmaleren Scheitel, grösseres, gewölbteres Auge, vor allem

aber dadurch, dass die Dornen der Schienen nicht aus dunklen Punkten entspringen, kegelförmiges Genitalsegment beim ♂, spitzere Fortsätze am linken Griffel, kürzeren, kräftigeren Penis und die distal sehr spitze Theca. Von *T. noualhieri* Reut. unterscheidet sie sich durch schmaleren Scheitel und das Fehlen dunkler Punkte an den Schienen, von den übrigen Arten durch die weissen, grün gefleckten Halbdecken. Im Bau der Genitalien und der Bedornung der Schienen steht sie *T. hippophaës* Fieb. und *michalki* E. Wagn. nahe, doch ist sie von diesen Arten leicht durch die Färbung der Oberseite, den Bau des Kopfes und die Genitalien zu trennen. Im System muss sie jedoch zu den letzteren gestellt werden.

RESULTS OF THE ARMSTRONG COLLEGE EXPEDITION
TO SIWA OASIS (LIBYAN DESERT), 1935.
UNDER THE LEADERSHIP OF PROF. J. OMER-COOPER

Odonata and Neuroptera

(with 4 Figures)

by D.E. Kimmins,
Department of Entomology, British Museum (Natural History)

The Odonata are represented by fewer species than the Neuroptera, and the fauna contains a larger proportion of the Ethiopian element — mainly widely — spread species. The chief interest in this part of the collection lies in the discovery of two closely-related species of Zygoptera (new to Egypt), *Ischnura evansi* Morton and *I. fountainei* Morton. *I. evansi* was described from examples taken at Amara and Basra, where it occurred in numbers together with examples of *I. fountainei*. It is interesting to note that these two species also occur together at the Siwa Oasis. As in Irak, *I. evansi* appears ot be the more abundant species, although as far as our records indicate, *I. fountainei* is the more wide-spread species, occurring in South Algeria, Tunisia, Tripolitania, Egypt, Palestine, Irak, Daghestan and Bokhara. The recorded distribution of *evansi* is South West Persia, Irak, Palestine, Egypt and Arabia. Although both species have been recorded from Palestine, I have no evidence that they occur together there.

The two species are closely-allied, the males differing in the detailed structure of the anal appendages, the shape of the posterior lobe of the prothorax, and in the shape and colouring of the pterostigma of the anterior wing. The females differ in the shape of the posterior lobe of the prothorax; those of *fountainei* are apparently all of the orange heterochromatic form; whereas the females of *evansi* are mainly of the olive-coloured heterochromatic form, but tend to develop dark humeral stripes, thus forming pale antehumeral bands, which are entirely absent in *fountainei*. Advantage has been taken of this opportunity to make comparative figures of the two species.

The Neuroptera consist of representatives of twenty-one species [1] : 12 Myrmeleonidae, 1 Ascalaphid, 1 Nemopterid, 2 Mantispids, and 5 Chrysopidae. As might be expected, the fauna is largely Eremian, but most of the species occur also in the Mediterranean subregion. Two of the Myrmeleonidae extend into the Ethiopian region, and one Chrysopid also occurs in the European sub-region.

ODONATA

Fam. Libellulidae

Orthetrum anceps (Schn.).

Baharein, 10-13, 17.vi., 15 ♂♂, 12 ♀♀; Zeitoun, 17.v., 29.viii., 4 ♂♂, 2 ♀♀; Khamissa, 22, 27.vi., 1 ♂, 1 ♀; El Arig, 8, 18.vi., 1♂, 4 ♀♀; Sitra, 15.vi., 1 ♀; Maragi, 24.vi., 1 ♂; Gara, 3.vi., 1 ♂.

Distribution : Mediterranean, Persia, Quetta.

Orthetrum sabina (Drury).

Siwa, 24, 26.iv., 8, 14, 22, 28.v., 21-22, 29.vi., 4, 9, 15, 25.vii., 7 ♂♂, 7 ♀♀; Khamissa, 22, 7.vi., 4, 27.viii., 4 ♂♂, 3 ♀♀; Jagub, 7, 17.viii., 3 ♀♀; Koreishid, 17.v., 1 ♂, 1 ♀.

Distribution : Somaliland to Samoa and N. Australia.

Acisoma panorpoides ascalaphoides (Rambur).

Siwa, 11, 14.v., 18.vii., 16-19.viii., 5 ♂♂, 2 ♀♀; Khamissa, 4.v., 22, 27.vi., 12 ♂♂, 10 ♀♀; Girba, 12.viii., 1 ♀; Koreishid, 30.vi., 1 ♂, 2 ♀♀; Maragi, 24.vi., 1 ♂.

Distribution : Africa and Madagascar.

Diplacodes lefebvrei (Rambur).

Siwa, 11-12.21.v., 29.vi., 10-11, 16-18.vii., 7 ♂♂, 7 ♀♀; Ilrhabit Uncorde, 18, 29.v., 4 ♂♂, 6 ♀♀; Tutnatee, 18.v., 26.vi., 1 ♂, 1 ♀; Ultabu Hirfala, 22.v., 1 ♀; Koreishid, 17.v., 1 ♂, 1 ♀; Khamissa, 4, 27.vi., 6 ♂♂, 2 ♀♀; Maragi, 24.vi., 14.viii., 5 ♂♂, 1 ♀; Gara, 3.vi., 3.vii., 5.viii., 5 ♂♂, 3 ♀♀; Girba, 12.viii., 1 ♂, 1 ♀; Tagzertie, 12.vii., 1 ♂, Baharein, 10-11.vi., 2 ♂♂, 3 ♀♀.

Distribution : Africa, Mediterranean.

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[1] A fine Psychopsid and the whole of my collection of over 200 specimens of Coniopterygidae appear to have been mislaid in the British Museum (J. Omer-Cooper).

Crocothemis erythraea (Brullé).

Siwa, 20-23.iv., 14, 22, 28.v., 3, 10, 29-30.vi., 31.vii., 10 ♂♂, 3 ♀♀; Ilgabet Resour, 12.v., 1 ♂; Ilrhabit Uncorde, 18, 29.v., 2 ♀♀; Siwa Depression, 17.v., 22, 29.viii., 2 ♂♂, 2 ♀♀; Khamissa, 4, 6.v., 22, 27.vi., 4.viii., 8 ♂♂, 10 ♀♀; Gara, 22.v., 3.vi., 1 ♂, 5 ♀♀; Tuthatee, 26.vi., 2 ♀♀; Girba, 12.viii., 1 ♂; Koreishid, 30.vi., 1 ♂; Jagub, 17.viii., 1 ♂, 1 ♀; Baharein, 10.vi., 1 ♂; Maragi, 24.vi., 1 ♂; El Arig, 7.vi., 1 ♀.

Distribution: Mediterranean, Africa, Madagascar.

Sympetrum fonscolombei (Selys).

Siwa Depression, 22.viii., 2 ♂♂, 1 ♀; Jagub, 18-19.viii., 1 ♂, 1 ♀; Khamissa, 22.vi., 2 ♀♀; Baharein, 12.vi., 1 ♀.

Distribution: Palaearctic and African.

Selysiothemis nigra (Lind.).

Siwa, 29.vi., 1 ♀; Koreishid, 17.v., 3 ♂♂; Tutnatee, 18.v., 26.vi., 3 ♀♀; Gara, 3.vi., 1 ♂, 1 ♀.

Distribution: Mediterranean, Irak.

Fam. Aeshnidae

Anax parthenope Selys.

Siwa, 22.v., 8.ix., 1 ♂, 1 ♀; Koreishid, 17.v., 1 ♂; Khamissa, 4.viii., 1 ♀; Gara, 2.vi., 1 ♀.

Distribution: S. Europe to Kashmir and West coast of India, and N. Africa.

Fam. Coenagriidae

Ischnura evansi Morton

Siwa, 29.iv., 1, 28, 31.v., 1, 29.vi., 9-13, 17-18, 26, 31.vii., 3-4, 13, 16-19.viii., 9.ix., 21 ♂♂, 24 ♀♀; Siwa Depression, 29.iv., 2 ♂♂, 1 ♀; Khamissa, 4.v., 22.vi., 2 ♂♂, 2 ♀♀; Ilgabet Resour, 12.v., 5 ♂♂; 4 ♀♀; Ultabu Tamrabat, 14.v., 1 ♂; Koreishid, 17.v., 30.vi., 3 ♂♂, 4 ♀♀; Tagzertie, 12-13.vii., 3 ♂♂, 1 ♀; Zeitoun, 29.viii., 1 ♂, 1 ♀; Ilrhabit Uncorde, 18.v., 1 ♂, 3 ♀♀; Sitra, 14-15.vi., 2 ♂♂, 1 ♀; Gara, 3-4.vii., 3 ♂♂, 1 ♀; Baharein, 11-12.vi., 3 ♂♂, 1 ♀.

Distribution: S. W. Persia, Irak, Palestine, Arabia.

Ischnura fountainei Morton

Siwa, 20.iv., 20, 30-31.v., 1, 22, 29.vi., 13, 15.vii., 1.viii., 8 ♂♂, 11 ♀♀; Siwa Depression, 29.iv., 1 ♂; Khamissa, 4.v., 5.viii., 1 ♂, 1 ♀:

Tagzertie, 12.vii., 1 ♀; Ilrhabit Uncorde, 18.v., 3 ♂♂, 2 ♀♀; Ultabu, 14.v., 1 ♀.

Distribution: S. Algeria, Tunisia, Tripolitania, Palestine, Irak, Daghestan and Bokhara.

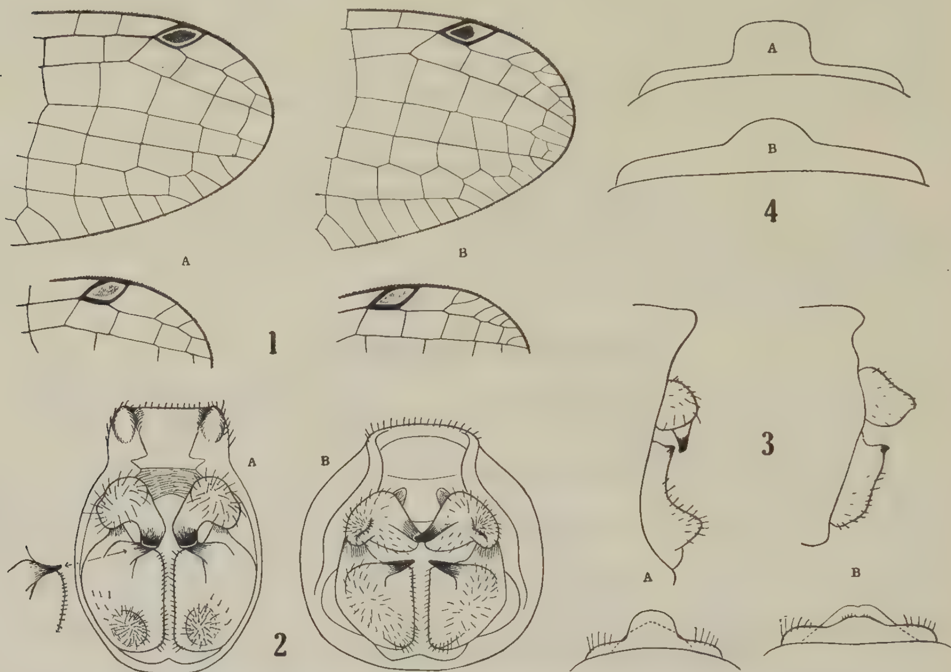

Fig. 1: Pterostigma of anterior and posterior wings of *Ischnura* spp. ♂♂: (A) *evansi* Mort., (B) *fountainei* Mort. — Fig. 2: Anal appendages of *Ischnura* spp. ♂♂ from behind: (A) *evansi* Mort., (B) *fountainei* Mort. — Fig. 3: Anal appendages from side (above) and posterior lobe of prothorax (below) of *Ischnura* spp. ♂♂: (A) *evansi* Mort., (B) *fountainei* Mort. — Fig. 4: Posterior lobe of prothorax of *Ischnura* spp. ♀♀; (A) *evansi* Mort., (B) *fountainei* Mort

NEUROPTERA

Fam. Myrmeleonidae

Palpares angustus McLachlan

Siwa Depression, 22.viii., 1 ♂.

Distribution: Algeria, Egypt, Tripolitania, Somaliland.

Neuroleon tenellus (Klug).

Siwa, 30, 31.v., 1, 4, 30.vi., 6, 10, 18.vii., 6 ♂♂, 6 ♀♀, 1?; Baharein, 13.vi., 1 ♀; Gara, 3.vii., 1?; Ilrhabit Uncorde, 18.v., 1 ♀; Zeitoun, 29.viii., 1 ♀.

Distribution: Egypt, Arabia, Palestine, Lebanon, Spain.

Creoleon cinerascens (Navás)

Siwa, 6.viii., 1 ♀.

Distribution : E. Africa, Egypt, Somaliland.

Creoleon griseus (Klug)

Ilrhabit Uncorde, 18.v., 4 ♂♂; Zeitoun, 24.vii., 1 ♀; Baharein, 17.vi., 1?; Siwa, 20, 31.v., 1, 22.vi., 19, 25.vii., 17, 20.viii., 2 ♂♂, 6?; Khamissa, 22.vi., 1?.

Distribution : Egypt, Irak, Algeria.

Pseudoformicaleo gracilis (Klug).

Siwa, 18.viii., 1 ♀; Sitra, 14-16.vi., 2 ♂♂, 2 ♀♀.

Distribution : Syria, Algeria, Arabia, Sahara.

Nophis teillardi (Navás).

Sitra, 14.vi., 3 ♂♂, 1 ♀; Khamissa, 22.vi., 1 ♀; Baharein, 17.vi., 1 ♂; El Arig, 8.vi., 3 ♂♂.

Distribution : Algeria, Egypt, Arabia.

Myrmecaelurus surcoufi (Navás).

Zeitoun, 18.vii., 29.viii., 1.ix., 1 ♂♂, 4 ♀♀, 1?; Khamissa, 22.vi., 1 ♂; Siwa, 19.viii., 1?.

Distribution : Algeria.

Myrmecaelurus laetus (Klug).

113 examples : Siwa, 20, 30.v., 4, 22, 26, 29.vi., 9, 12, 15, 18, 21, 25.vii., 1, 9, 15, 17, 19-21, 31.viii., 9.ix.; Ain Nouamissa, 16.vi.; Sitra, 14-15.vi.; Gara, 3, 13.vi., 3-4.vii.; Khamissa, 22, 27.vi.; Maragi, 24, 29.vi., 14.viii.; Tagzertie, 12.viii.; Jagub, 14.viii.; Tenterad, 18.vii.; Baharein, 9, 11, 17.vi.; El Arig, 8.vi.

Distribution : Arabia, Egypt.

Cueta lineosa (Rambur).

Siwa, 13, 21-22.vii., 1 ♂, 1 ♀; Zeitoun, 30.viii., 1 ♀; Khamissa. 22.vi., 1 ♂.

Distribution : Egypt, Algeria, Djibouti, Arabia, Turkestan, Syria, Asia Minor.

Solter rothschildi Navás.

Siwa, 20.v., 30.vi., 11.vii., 3 ♀♀; Gara, 3.vii., 1 ♀.

Distribution : Sahara, Algeria

Gepus invisus (Navás).

Gara, 3-4.vii., 3 ♂♂, 1 ♀; Khamissa, 27.vi., 1 ♀; Baharein, 17.vi., 1 ♀; El Arig, 8.vi., 1 ♀; El Arig Desert, 18.vi., 1 ♂.

Distribution: Algeria, Egypt, Arabia, Irak, Transjordan.

Morter hyalinus (Oliv.).

141 examples: Siwa, 20.iv., 20, 25-26, 28, 30-31.v., 1-4, 29.vi., 6, 9-13, 18-19, 25-26.vii., 1, 7, 13, 16-20, 31.viii., 6, 8-9.ix.; Khamissa, 22.vi., 28.viii.; Gara, 3.vi., 3-4.vii.; Maragi, 29.vi., 14, 25.viii.; Baharein, 11-12.vi.; Tagzertie, 12-13.vii.; Ilrhabit Nachou, 15.v.; Zeitoun, 29.viii.; Tutnatee, 13.v.; Sitra, 14-15.vi.

Distribution: Arabia, Canaries, Syria, Spain, Senegal, Libya, Irak, Algeria, Lebanon.

Fam. Ascalaphidae

Helicomitus festivus (Rambur).

Siwa, 28.v., 3-4.vi., 18.vii., 1 ♂, 4 ♀♀; Ilrhabit Uncorde, 18.v., 1 ♀; Baharein, 11-17.vi., 5 ♂♂, 9 ♀♀; Khamissa, 4.v., 22.vi., 4 ♂♂, 7 ♀♀; El Arig, 8.vi., 1 ♂, 2 ♀♀; Maragi, 24.vi., 1♀; Sitra, 15.vi. 1♂.

Distribution: Throughout Africa, and in Madagascar and Arabia.

Fam. Nemopteridae

Savignyella costatus (Klug).

Siwa, 25.vi., 17.vii., 2 ♀♀.

Distribution: Egypt.

Fam. Mantispidae

Mantispa auriventris Guerin

Siwa, 24.vi., 1 ♀.

Distribution: Egypt, Rhodes, Greece.

Euclimacia africana Esb.-Pet. var. ragazzina Navás.

Siwa, 1.v., 10.viii., 2 ♀♀.

Distribution: Nubia (type), Eritrea (variety).

Fam. Chrysopidae

Nothochrysa stigmatica (Rambur)

El Arig, 8.vi., 1 ♀.

Distribution: Spain, Tunisia, Algeria, Syria

Chrysopa carnea Steph.

83 exemples : Siwa, 22, 26, 29.iv., 3, 5, 12, 25, 31.v., 1, 30.vi., 9.vii., 6, 9, 13, 16-19.viii., 6.ix. ; Maragi, 14.viii. ; Zeitoun, 29. 30.viii. ; Baharein, 9-13.vi. ; El Arig, 8, 18.vi. ; Ilrhabit Uncorde, 15.v.

Distribution : Palaearctic and Mediterranean.

Chrysopa mutata McL.

3 examples : Siwa, 18-19, 22.iv.

Distribution : Algeria.

Chrysopa storeyi Navás

2 examples : Baharein, 11.vi.

Distribution : Egypt.

Suarius nana (McL.)

1 example : Siwa, 6.viii.

Distribution : Asia Minor, Persia, Egypt, Sahara, Algeria.

The Theraphosidæ in Egypt, with a description of *Chætopelma shabati* spec. nov.

[Araneae]

(with 10 Figures)

by A.I. Hassan, Ph.D.,
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HISTORICAL

The family Theraphosidae was created by Walckenaer, 1805. Simon (18), in his first volume, discussed Walkenaer's denomination and pointed out that that name is meant for the family of spiders whose essential character laid in the shape and direction of the chelicerae. The authors who came after Walckenaer and used such a single one character, as a basis for classification, fell in Walckenaer's mistake. That led to the grouping together types which are totally different from each other as *Mygales*, *Segestries*, and *Dysderes* (8).

Simon applied the name Theraphosae to one of the suborders of Araneida, including the spiders with the chelicerae extending along the main axis of the body, and possessing two pairs of lung-books which are conspicuous on the ventral surface of the abdomen, whether they have segmented body or not. He divided this suborder into 3 families. The specimens, which are under consideration here, fall accordingly under the family Aviculariidae, described by Simon as the actual family including the genera *Mygale*, *Sphodros*, and *Missulena* of Walckenaer (Apt. I), 1837, and the genera *Ctenіza*, *Mygale*, and *Actinopus* of Koch (7). The most important work on this family was done by Ausserer (1 and 2). Hence Simon (17) proposed a new classification of Aviculariidae which differed in many points from that of Ausserer, and he then improved it in his book (18).

He divided this family into seven subfamilies, and according to that, the specimens at hand fall under the group Chaetopelmatae of the subfamily Aviculariinae.

Petrunkevitch (9), and Warburton (19) nearly followed the same scheme of classification done by Simon. Warburton mentioned that Aviculariidae was first known by the name Mygaloidea which was established by Walckenaer, 1802, but the name was preoccupied, having been used by Cuvier (Mammalia) in 1800. Petrunkevitch did not use the term Theraphosae at all, and he included the family Aviculariidae under the suborder Mygalomorphae (spiders with unsegmented abdomen, two pairs of lung-books, and chelicerae so articulated that the fangs move in a plane parallel to the plane of symmetry). He said that Aviculariidae was a very large family comprising all recent Theraphosid spiders; the separation of this family into subfamilies and genera was based on the structure of the tarsi and the number of claws, number and structure of the spinnerets, presence or absence of a rastellum on the chelicerae, number of eyes, and shape of eye-group, carapace and sternum.

In the next year Petrunkevitch published his paper "On Families of Spiders" (10) to express his own views concerning the probable evolutionary lines along which, as he thought, the separation of spiders into different branches had taken place. He tried to make use of the additional information of Comparative Anatomy and Embryology of spiders, and proposed a classification which was more or less favourably accepted. The criticisms directed to it by Savory (14) and by Giltay (5), were attempts to carry Petrunkevitch's work a step farther.

Petrunkevitch (11), divided the spiders, which were included under the suborder Theraphosae of Simon, into three suborders according to the segmentation of the abdomen and the shape of the chelicerae. He used the term Theraphosidae of Walckenaer for the family of spiders included by Simon under Aviculariidae. The main characters which he used as a basis and led him to this classification were :

Abdomen not segmented in the adult; chelicerae so articulated that the fangs move up and down in a vertical plane; two pairs of lungs (suborder Mygalomorphae).

Claw-tufts present; two claws with a single row of teeth or claw smooth; maxillary lobes wanting; labium free (branch Hypodemata).

Four spinnerets; last joint of posterior spinnerets at least as long as, often longer than, the preceeding joint; claws similar, pectinate in a single row; chelicerae sometimes with a lyra, never with a rastellum; eight eyes in a compact group, heterogenous, thoracic fovea is transverse (family Theraphosidae).

Again Petrunkevitch (12) emphasised this nomenclature and classification. Savory (14) praised this work and said "The most recent system of Petrunkevitch was noteworthy because it was based on a study of internal structure and not merely on external form".

IDENTIFICATION

According to Cambridge (4) the family Theraphosidae is represented in Egypt by two genera and species : *Nemesia cellicola* Sav., and *Chaetopelma aegyptiaca* Dol.

The specimens with which this work is concerned belong to the family Theraphosidae, according to the classification of Petrunkevitch, and to genus *Chaetopelma*, as they carry the characters confined to this genus by E. Simon (18). The scopulae of the tarsi of the posterior two pairs of legs are divided by a longitudinal band of bristles, which are not rhombous in shape as that of *Chaetorrhombus*. The scopulae of the tarsi of the anterior pair of legs are not divided. In the specimens, the scopulae of the tarsi of the second pair of legs are divided by a band of bristles which is thinner than those of the third and fourth pairs. This is quite different from what Simon had mentioned about *Cyclosternum* — that very rarely a slight division was marked on the tarsi of the second pair of legs of *Cyclosternum gaujoni* Simon, in such case the division was not easily indicated on the tarsi of the third pair. In the specimens, the ocular tubercle is not high. The anterior median eyes are somewhat smaller than the anterior laterals, and just larger than the posterior medians which are widely separated. Also the cephalic part of the cephalothorax is convex, and the thoracic fovea is large and slightly recurved. The description of the pedipalps of *Chaetopelma* applies very nearly to those of the males of the specimens. The legs are armed with numerous spines specially on the posterior tibiae and metatarsi. The males possess two spurs on the ventral side of the anterior tibiae. On examining these spurs of the males among the specimens, it is found that they resemble nearly those of *Chaetopelma olivacea* C. Koch, but they differ in few points.

Simon, Warburton (19), and Berland (3) mentioned that *Chaetopelma* inhabited Egypt, Syria, and Arabia; and there was only one common species, *C. olivacea* Koch, which was recorded by Koch (6). Petrunkevitch (11) listed it among the genera of the subfamily Ischnocolinae of the family Theraphosidae, and the author believes it is the right place for this genus.

The specimens of *Chaetopelma* were collected from two different localities : from underneath thorny bushes in the desert near Fayoum, and from dark dampy places in towns as drains, lavatories, old wells, etc.. The specimens from these different localities differ greatly from each other.

The description to *Chaetopelma aegyptiaca* Aus. (1) applies to a great extent to the species from the first locality. Only four females were collected from Fayoum. This species is going to be redescribed fully in order to show the differences between it and the other species.

The other species from the dark dampy places differs from *C. olivacea* Koch in many points which will be discussed below. According to that, the author prefers to give it a new name — *Chaetopelma shabati* spec. nov. — as it is commonly known in Egypt by the name of "Abu-shabat", and in Syria, Iraq, Transjordania, and Hedjaz by the name of "Shabath".

Roewer (13) points out the synonymy of *Chaetpelma olivaceum* C. Koch (5) as follows :

Mygale olivaceum C.L. Koch 1842, Die Arachniden, 9, p. 34, t.-f. 712.

Avicularia straitocauda Simon 1873, *Mém. Soc. Sci. Liège* (2) 5, p. 203.

Ischnocolus straitocauda Ausserer 1875, *Verh. zool.-bot. Ges. Wien*, 25, p. 173.

Chaetopelma olivaceum Simon 1892, Hist. Nat. Ar., 1 (1), p. 140, f. 124.

Chaetopelma olivaceum Strand 1907, *Jahresb. Ver. Nat. Württbg*, 63, p. 21.

On reading the descriptions given by these different authors, it is found that the specimens which have been examined differ from theirs in many points :

Ausserer (1) mentioned that the anterior middle eyes were in a higher position in comparison with the lateral eyes, and they appeared as if they were laid over them. This was not true concerning *C. shabati*. Also he described the anterior spur on tibia I of the male as such "It is oblique and edged with a very regular series of pointed and adjoining teeth, and it carries a little below towards the middle a tooth which is long and somewhat sinuous." This last tooth was not present on the anterior large spur of male *C. shabati*, but there was a straight spine on its anterior side.

Simon (16) mentioned that the breadth of the cephalothorax is equal to its length; but in the specimens of *C. shabati* which were examined it is noticed that the breadth of the cephalothorax was shorter than the length by about 1 mm. He described the fovea (fossa) on the cephalothorax as being rounded; while in *C. shabati* it was more or less triangular.

Simon (16) also described the integument as of a brown red shade, and covered with a thick pubescence of clear brilliant fawn-colour; while in *C. shabati* it was dark brown on the cephalothorax and legs and pale yellowish on the abdomen. It was covered with thick pubescence of chestnut colour.

About the two spurs on tibia I of the male, Simon (16) mentioned that

the small spur was bifurcated, the external branch robust and obtuse, and the internal thin and slightly convoluted; while in *C. shabati* the small spur was not bifurcated, but there was a thick spine beside it.

Ausserer (2) confirmed the description of the small spur given by Simon (16). He mentioned also that the lip was as long as wide; while in *C. shabati* it was wider than long.

Simon (17) confirmed the presence of the lateral tooth on the anterior spur.

On examining the specimens of *C. olivaceum* Koch found among the collection of spiders in the British Museum (Natural History) and identified by **Pocock**, the cephalothorax is found to be longer than wide by 1.5-2 mm., the hairs on the eye-tubercle are not so long as in *C. shabati*. The epipynum does not show the attachment of the two lateral openings, and its posterior edge is procurved and not recurved as in *C. shabati*.

DESCRIPTION OF THE SPECIES

Chaetopelma shabati spec. nov.

Male (Holotype)

Length of body, 33.5 mm.

Length of cephalothorax 16.5 mm.; broadest region, between second pair of legs, 15 mm.

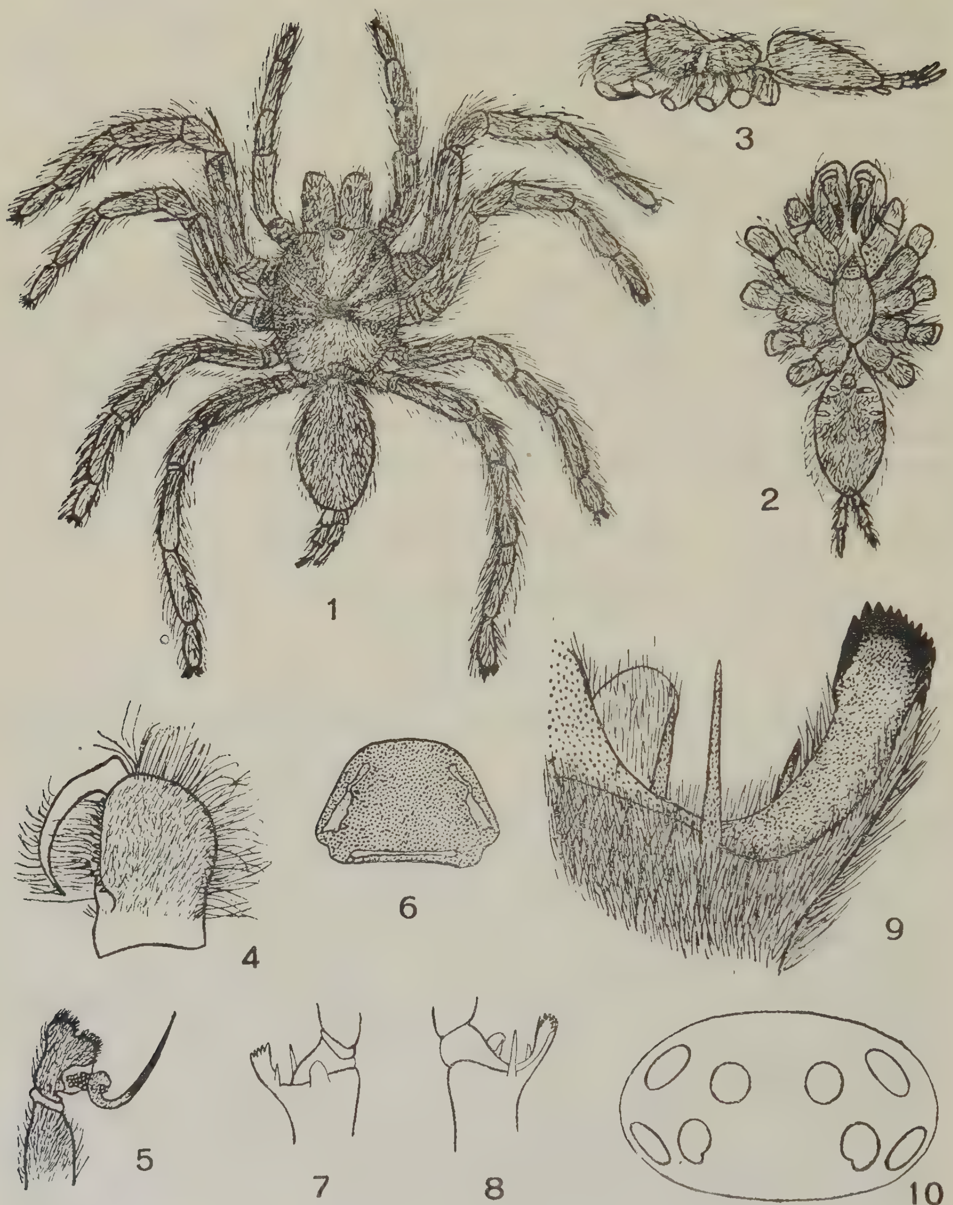
Chelicerae (extending forwards), 6 mm. from the anterior edge of the cephalothorax.

Length of abdomen, 17 mm.; its broadest region 11 mm.

Spinnerets (extending backwards), 7 mm. from the extreme posterior end of the abdomen.

The general colour of the species is blackish brown when kept in alcohol with little glycerine. In nature it appears so, as it is usually seen at night coming out of dampy places. When kept dry, its colour becomes uniformly chestnut brown.

The cephalothorax (Fig. 1) is convex, longer than broad, elevated at the anterior central region where the chelicerae are to be seen extending forward. It is covered by chestnut pubescence with some brownish long hairs on the elevated part. The colour of the integument is dark brown. The margins are fringed with long brownish hairs. The thoracic fovea is found in the centre of the thoracic region between the second and third pairs of legs. It is a triangular pit with the apex directed anteriorly. Its posterior margin is slightly procurved; there can be seen three pairs of transverse shallow depressions radiating from the edge of the fovea towards the margin of the carapace. The anterior depression ends between the pedipalp and the



Chaetopelma shabati spec. nov.

Figs. 1, 2 and 3 : Dorsal, ventral, and lateral views respectively (natural size). — Fig. 4 : Chelicera, proximal side, showing the shape of the fang, the row of teeth and the fringe of bristles on the ventral surface (× 4). — Fig. 5 : Palpal organ (× 4). — Fig. 6 : Epigynum (female) (× 4). — Fig. 7 : Tibial spurs, viewed from proside (× 4). — Fig. 8 : Tibial spurs, viewed from retroside (× 4). — Fig. 9 : Tibial spurs, viewed from retroside, showing arrangement of the teeth on the large ventral spur (× 20). — Fig. 10 : Eye group (× 20).

first leg, the middle between th first and the second legs, and the posterior depression between the second and the third legs.

The eight eyes are found on a tubercle which is one and a half millimetres in height. It is situated at the centre close to the anterior edge of the cephalothorax. Its breadth is almost twice as its length. It is dark brown in colour with long hairs scattered between the eyes. The eyes (Fig. 10) are arranged in two raws; the anterior one is straight, while the posterior row is recurved. The anterior median eyes are more or less rounded. They are separated by a distance equal to the diameter of one of them. The anterior lateral eyes are ovoid in shape, and are the largest of all eyes. The posterior median eyes are waxy white. They are rounded with a notch at the postero-lateral inner margin. They are widely separated from each other, and they are closer to the posterior lateral eyes. The latter are the smallest of all eyes. They are ovoid in shape.

The chelicerae (Fig. 4) are powerful, parallel to the long axis of the body. Each of them measures 7 mm. from the dorsal aspect. They are covered dorsally with brown bristles, and the sides with few scattered brown hairs. The ventral surface is fringed with reddish long bristles. On the inner edge of this surface, the chelicera carries twelve short stout teeth beside which the fang bites. The fang is shining black. It measures about 5.5 mm. in length, and works in a vertical plane parallel to the long axis of the paturon like the rest of the members of the family.

The labium (Fig. 2) is free, wider than long. It is about 1.8 mm. in length; subquadrate in shape, with the anterior edge slightly procurved, and fringed with thick dark brown bristles. There are six procurved rows of denticles arranged near its anterior end.

The maxilla (Fig. 2) is divergent, long, parallelogram in shape. The maxillary lobe is not present. The apical angle of the maxilla appears as a conical projection. The inner edge is fringed with reddish long bristles resembling those on the ventral surface of the chelicerae. Its ventral surface is covered with blackish brown hairs. There are also some denticles scattered on the ventral surface near the proximal end like those on the labium.

The sternum (Fig. 2) is oval in shape, truncate. It measures 7.5 mm. in length, and 5 mm. in breadth. The integument is dark brown in colour, covered with chestnut brown pubescence.

The legs have the same colour as that of the cephalothorax. On the dorsal side of the segments of the legs except the tarsi, there are two longitudinal thin brown stripes separated by a wide dark stripe. The fourth leg is the longest and the third is the shortest. The arrangement of the legs

according to their lengths is 4:1:2:3. The measurements of the different segments in the different legs are shown in millimetres in the following Table :

	COXA	TROCHANTER	FEMUR	PATELLA	TIBIA	METATARSUS	TARSUS	TOTAL
Leg I......	7	2	12	7	11	10	6.1	55.1
Leg II.....	6	1.5	13	6.5	10	8 2	6	51.2
Leg III....	6	2	11	5	8.5	10	6	48.5
Leg IV	5	2.5	14	6	12	13	7	59.5
Palp	5	2	9	4	8	—	2	30

From the preceeding Table it is noticed that femur II is next in length to femur IV, patella I is the longest, then comes patella II which is longer than patella IV of the longest leg. The exceeding in length in leg IV occurs in the femur and metatarsus, while metatarsus I equals in length to metatarsus III of the shortest leg.

The legs are covered with brown hairs except the ventral surfaces of the coxae, trochanters, and femora which are covered with dark brown hairs like those on the sternum. The segments are devoid of spines except on the tibiae and metatarsi of the different legs.

On metatarsus I there are two small spines on the ventral distal end.

On tibia I there are on the ventral side 1 central, 2 near distal end; and on the proside 1 central and 1 near distal end.

On metatarsus II there are 1 near proximal end, and 1 on distal end on the ventral side.

On tibia II there are on the ventral side 1 near proximal end, 1 central and 1 on distal end; and on the proside 1 central and 1 near distal end.

On metatarsus III there are on the ventral side 2 near proximal end, and 1 on distal end; and on the proside 1 near proximal end, 1 central and 1 near distal end; and the same number and arrangement of the spines on the retroside of this segment.

On tibia III there are on the ventral side 1 on proximal end, 1 central and 1 on distal end; and on each of the proside and retroside there are 1 near proximal end, 1 central, and 1 near distal end.

On metatarsus IV there are on the ventral side 2 near proximal end, 2 central and 1 on distal end; and on each of the proside and retroside there are 1 near proximal end, 1 central and 1 near disal end; and on the dorsal side there are 1 central and 1 near distal end.

On tibia IV there are on the ventral side 1 near proximal end, 1 central and 2 on distal end; on the proside there is 1 near distal end; and on the retroside there are 1 near proximal end, 2 central and 1 near distal end.

On the ventral side of tibia I, at its distal end, there are two strong chitinous spurs (Figs. 7, 8, and 9). They differ in size and shape. The smaller one is antero-ventral in position but shifted a little dorsally. It is short, finger-like, obtuse and straight. It carries no teeth, nor it is grooved from inside. The larger spur is ventral in position. It is more prominent and curved like a hook. It carries at its tip 18 teeth of different sizes. The peripheral ones are stronger, while the terminal teeth are short and slender. This spur appears as if it is grooved from inside. There is no lateral tooth near its middle. The function of these spurs is not observed. They may be accessory organs which are used during copulation. They are not stridulating organs, as there are no traces of the friction of these spurs against the metatarsus which rests upon them.

The p e d i p a l p is leg-like, having the same colour, the pale stripes and the covering of hairs as the legs. From the Table of measurements one can see that it nearly equals in the lengths of its different segments to those of leg III, the shortest leg; except in the length of the tarsus, as it is modified to carry the palpal organ.

The palpal organ (Fig. 5) is not very conspicuous as it is not bulbous in appearance. The tarsus is very short and the alveolus is prolonged up to the extremity of the segment. It occupies nearly all its ventral surface. The receptaculum seminis is very simple and its parts are quite clear. The fundus is a swallen bulb attached to the alveolus by a small pedicle; then the organ is twisted towards the proximal side of the appendage and forms the reservoir which becomes slender gradually and leads to the setiform long ejaculatory duct (the embolus).

The a b d o m e n is oval in shape. The colour of its integument is pale yellow. It is covered with thick pubescence of chestnut brown colour. The hair covering the abdomen is longer than that on the cephalothorax. The colour of the four pulmonary sacs is paler than that of the integument. The two posterior spinnerets are very long, each one about 7 mm. in length; each is composed of three segments, the proximal is 3 mm., the middle is 1.5 mm., and the distal is 3.5 mm.. The two anterior spinnerets are very short and apart from each other. Each is composed of one segment only.

F e m a l e (A l l o t y p e)

Length of body, 35 mm.

Length of cephalothorax, 18 mm.; breadth 16 mm.

Chelicerae (extending forwards), 7 mm.

Length of abdomen, 17 mm.; breadth 12 mm.

Spinnerets 8 mm.

Colour and pattern are the same as those of the male; except that tibia I is devoid of the two spurs which are seen on the ventral side of that of the male. The measurements of the different segments in the different legs are shown in millimetres in the following Table :

	COXA	TROCHANTER	FEMUR	PATELLA	TIBIA	METATARSUS	TARSUS	TOTAL
Leg I	7	3.6	14	7	11.5	9	6	58.1
Leg II	6	3.5	13.4	7	10	8	5.5	53.4
Leg III....	5	2.5	11	4	9	9	5.5	46
Leg IV	6	3	14	6	11	12	7	59
Palp	6.8	3	11	5	7.5	—	6	39.3

Leg I is nearly equal to leg IV in length. The remarks that were observed in comparing the segments of the different legs of the male together are also noticed here; except that femur I equals in length to femur IV, and then comes femur III which is the shortest. It is also noticed that the lengths of the legs are shorter than those of the male, specially when the size of the body is taken into consideration.

The epigynum (Fig. 6) is situated between the anterior pair of the lung-books. It is nearly trapezoid in shape, with a thin long transparent patch on each side. There are two openings seen near the posterior edge of the epigynum which is procurved. These two openings appear to be connected together.

Chaetopelma aegyptiaca Aus.

The ♀ differs from *C. shabati* spec. nov. in many aspects, for instance, the general colour of the body and the arrangement of the spines on the segments of the different legs. Besides it inhabits the desert.

Length of body, 35 mm.

Length of cephalothorax, 15 mm.; breadth, 14 mm.

Chelicerae (extending forwards), 7 mm.

Length of abdomen, 20 mm.; breadth 12 mm.

Spinnerets, 7 mm.

It is noticed from these measurements that the abdomen exceeds the cephalothorax in length by 5 mm., while in the female of the previous species the cephalothorax exceeds the abdomen by 1 mm. in length.

The colour of the integument is reddish brown when kept in alcohol and glycerine. The pubescence which is covering the body is fawn-coloured. The labium is wider anteriorly than posteriorly. Its anterior edge is procurved and fringed with pale-coloured bristles. The colour of the bristles on the ventral surface of the chelicerae and on the inner edges of the maxillae is yellowish brown.

The measurements of the different segments of the different legs are given in millimetres in the following Table :

	COXA	TROCHANTER	FEMUR	PATELLA	TIBIA	METATARSUS	TARSUS	TOTAL
Leg I	5	2	10	6	8	6.5	4.5	42
Leg II	4.5	1.5	9	5	8	6.5	4	38.5
Leg III....	4	1.5	8	3	6	6.5	4	36
Leg IV....	5	2	11	4	9	9	5 5	45.5
Palp......	4	2	8	4	5	—	5	28

From these measurements, the great difference between the two species can easily be noticed. Here the arrangements of the legs according to their lengths is 4 : 1 : 2 : 3. The differences in length between 1 and 4, and 2 and 3 are not so great. Coxa I is equal in length to coxa IV, while in the female of *C. shabati* it is longer. Trochanter I equals to trochanter IV, while there it is longer. Trochanter III equals to trochanter II, while there it is shorter than trochanter II. Femur IV is longer than femur I, while there they are equal. Patella I is longer than patella II, while there they are equal. Tibiae I and II are equal in length, but there tibia I is not only longer than tibia II but also it is the longest of all tibiae of the other legs. Metatarsus I, II, and III are equal, while metatarsus I and III in the other species are equal in length, and metatarsus II is the shortest. The arrangement of the tarsi according to their lengths resembles that of the previous species.

There is also an important difference in the arrangement of the spines on the different segments of the legs.

On metatarsus I there is only one long spine on the ventral distal end.

On tibia I there are two on the ventral distal end.

On metatarsus II there are 2 on the ventral distal end.

On tibia II there are on the ventral side 2 on distal end, and on the pro-side 1 central.

On metatarsus III there are on the ventral side 2 near proximal end, 1 central, and 2 on distal end ; on the proside 2 on proximal end, 1 central.

and 1 near distal end; and on the retroside 1 central, and 1 on distal end.

On tibia III there are on the ventral side 2 near proximal end, 1 central, and 2 on distal end; on the proside there is 1 central; and on the retroside 1 near proximal end, and 1 central.

On metatarsus IV there are on the ventral side 2 near proximal end, 3 central, and 3 on distal end; and on each of the proside and retroside 1 near proximal end, 1 central, and 1 on distal end.

On tibia IV there are on the ventral side 2 near proximal end, 3 central, and 2 on distal end; on the proside there is 1 near proximal end and 1 central; and on the retroside 1 near proximal end, and 1 central.

The two species, *Chaetopelma shabati* spec. nov. and *Chaetopelma aegyptiaca* Aus., resemble each other in the other characters.

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Field Tests on a number of old and new Insecticides against *Thrips tabaci* Lind. (Thysanoptera) attacking Cotton seedlings and Onion in Egypt

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INTRODUCTION

In many countries where *Thrips tabaci* causes serious damage to numerous host plants of more or less economic importance, great attempts have been made to combat this insect by using different insecticides. Before and during the last war, investigators both here and abroad, gained satisfactory results in controlling thrips by applying some old insecticides of which the author will only refer in this paper to those which were chosen for application against thrips in Egypt, and which proved to be the best up to that time.

After the end of the last war new insecticides appeared and proved to have far better killing efficiency than the old ones. These new insecticides were introduced to Egypt in either liquid or dust form and were also tested here against thrips and other insects. The list given in pages 222-224 includes a number of old and new insecticides tested under field conditions in Egypt. List in pages 225-226 contains the amounts and prices of insecticides applied per feddan and one application.

Parallel field tests on different insecticides were carried out in Egypt for many years at Sakha Farm (Gharbia Province) to control *Thrips tabaci* attacking cotton seedlings (variety Karnak = Giza 29) and also at Shandawil Farm (Girga Province) against the same insect attacking onion; both farms belonging to the Ministry of Agriculture.

For every insecticide two parallel tests by five repetitions (plots) each were arranged, one test for one application, the other for two, while for the check another five repetitions were included. The whole plots for all insecticides under test and for the check as well, were distributed at random. Each plot covered an area of 105 m^2 (7×15 m.). The field tests were carried out at the same period of the season and in the same locality every year. By the two-application test the second treatment followed the first ten days later. The number of thrips was counted from equal numbers of holes, i.e. 25, in the case of cotton seedlings, or of plants in the case of set-onion, or of inflorescences in the case of seed-onion. These countings were made at ten days interval every year, twice or thrice for the one-application test and twice or thrice or even five times for the two-application test according to circumstances. The same number of thrips countings was made in the check plots on the respective dates of the parallel tests.

As regards the old insecticides the author will give only the results of the years 1946 and 1947 for the sake of comparison with the results of some new insecticides tested here in both years.

After 1947, the old insecticides were cancelled from the field tests, while the new ones were continued.

Although the field tests are dealing with certain insecticides against the same insect, and although their results can be discussed in one chapter, yet the author prefers to divide the subject into two chapters, namely one for the results of the field tests on cotton seedlings, and one for those on onion.

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CHAPTER I

Insecticidal Field Tests on Cotton seedlings

Germination of cotton seed needs a temperature of at least 12° C, while its optimum lies at 22° C. The development low-temperature of *Thrips tabaci* is 7-8° C., and its optimum temperature is 23-27° C. A relative humidity of not less than 70% is necessary for the development of thrips to continue. The time suitable for early cotton sowing at Sakha is around the middle of March in normal years. The thrips infestation generally begins when the young seedlings are 3-4 weeks old. When ecological factors, especially climatic conditions are favourable for the germination and early growth of the seedlings, the tender leaves are sooner or later visited by thrips for

the purpose of sucking and egg-laying as well. If the same favourable climatic conditions exist during incubation and hatching periods the population of thrips increases enormously causing more or less injury according to the degree of its intensity. Application of insecticides is carried out mostly one month after the date of sowing, of course only when the number of thrips per plant or hole shows the necessity of taking control measures. When climatic conditions are unfavourable, germination and early growth are either retarded, or cotton seeds are spoiled, and resowing is thus needed sometimes more than once. Infestation is also delayed or even weakened to such an extent that in some years the season passes without any noticeable effect of thrips on the plant. The critical period of thrips attack to cotton seedlings at Sakha is normally from the middle of April to the middle of May and the infestation reaches its height nearly at the end of April, due to the fact that climate conditions at that time are around the optimum for this insect.

According to what has been already mentioned, the first treatment for both parallel tests was given on April 15th, every season, while the second treatment in the two-application test followed ten days later, i.e. on April 25th.

By the one-application test, three countings of thrips were made, the first one day after treatment (April 16th), the second, ten days later (April 25th), and the third, twenty days after treatment (May 5th).

By the two-application test, five countings of thrips were made, the first and second, just at the same times as for the one-application, the third counting, one day after the second treatment (April 26th), the forth, ten days later (May 5th), and the fifth and last counting, twenty days after second treatment (May 15th).

The test lasted one month every year within one generation, as could be seen from the increase and decrease of population of thrips in this period of the season. The average number of thrips in the check plots for the respective dates of counting are given below :

YEAR	NUMBER OF THRIPS			
	April 16th	April 25th	May 5th	May 15th
1946	98	1217	155	140
1947	646	1414	595	262

It may be useful to describe the technique adopted for counting thrips under field conditions. For this purpose a white sheet of paper, 20×20 cm^2, is held in the left hand and kept near the surface of the soil just beside a hole

of cotton seedlings, in such a position, that, when cotton leaves are tapped twice with the right hand against the paper, some thrips would fall off onto it and could then be easily counted. This action has to be repeated several times at every hole, until no more thrips would fall off. The adults should be counted immediately before they begin to fly away. The larvae are easy to count, as they move slowly. With continual practice, this operation would be satisfactorily done. This technique of counting of thrips in the field is naturally not exact and is liable to errors. This disadvantage can, however, be neglected, as it applies to every counting.

In 1947 climatic conditions were more favourable for the germination and early growth of cotton seedlings, as well as for the incubation and hatching of thrips, than in 1946. The average number of holes in which seedlings grew was 94% in 1947 against 87% in 1946. The effect of such unfavourable weather conditions in 1946, on the development of thrips, was especially noticed in the period around April 15th, and May 5th, and in consequence of that effect, retardation of incubation and also decrease of population, were attributed. On April 16th, the average number of thrips in the check plots in 1947 was about 6.6 times, and on May 5th, 3.8 times as much as the average number of the relative dates in 1946.

The average percentage of damage of holes of seedlings by thrips was consequently more in 1947 (21.6%) than in 1946 (12%), i.e. 1.8 times as much.

In the following Tables the results of the field tests on different old and new insecticides are given for the years 1946, 1947 and 1948 for the one-application (Tables I, III, and V), and also for the two-application parallel tests (Tables II, IV, and VI). The figures indicate the killing efficiency of the insecticides in percentages.

In 1946 the following insecticides were tested :

(I) Paris green combination; (II) Orthodichlorbenzine combination; Wood-tar caustic soda; (IV) Volck emulsion; (VII) Psylortox, 0.4% concentration; (VIII) Psylortox, 0.2% concentration; (IX) P.31 Emulsion Psylortox; (X) P.31 Emulsion; (XI) P.31 Miscible oil Psylortox; (XII) P.31 Miscible oil; (XIII) Pestox Suspention; and (XXIII) Agrocide III liquid.

The results of the killing efficiency of these insecticides tested under field conditions are recorded in Tables I and II.

Before discussing these figures we have to consider the following points:

(a) The effect of the insecticide on the plant.

(b) The effect of the insecticide on the insect.

(c) The lasting effect of the insecticidal residue.

(d) Penetration of the insecticide through the epidermis.

(e) The accumulation of the insecticide outside and inside the plant tissue.

(f) The stableness of the insecticide against climatic conditions, especially sun heat, light and rain.

(g) The stableness of the insecticide inside the plant.

(h) The stimulating effect of the insecticide on the plant.

(i) The reaction of the insect to the insecticidal chemotropism.

(j) The effect of the insecticide on the natural enemies of the insect under control.

(k) The effect of the different doses and number of repetitions of the insecticide from the economic point of view.

(l) The effect of new growth in the period following treatment on the toxicity of an insecticide by lowering its killing efficiency.

TABLE I

One-application Test 1946

NUMBER OF INSECTICIDE USED	KILL PERCENTAGE BY COUNTINGS			
	First	Second	Third	Average
(I)	25.5	47.9	43.8	39.1
(II)	41.8	47.4	8.1	32.4
(III)	30.6	40.2	13.8	28.2
(IV)	11.2	41.6	—	17.6
(VII)	54.1	54.8	31.3	46.7
(VIII)	56.1	52.0	40.0	49.6
(IX)	81.6	79.9	70.6	77.4
(X)	74.5	65.5	65.6	68.5
(XI)	71.4	77.6	51.9	67.0
(XII)	77.6	76.8	68.8	74.4
(XIII)	54.1	48.8	—	51.5
(XXIII)	91.8	33.8	—	67.8

From such fundamental studies one could make the following observations :

By comparing the figures in Table I denoting the killing efficiency of the insecticides in the second counting of thrips with those in the first one, respectively, a noticeable increase of kill percentage was recorded in all the old insecticides (I to IV) and only in insecticide (XI) amongst the new ones. Insecticides (VIII), (X), (XIII) and (XXIII) showed, on the contrary, a decrease of kill percentage, mostly associated with an increase of population of thrips at the second counting, namely, ten days after application. Insecticides (VII), (IX) and (XII) appeared to have almost similar kill percentage in both countings respectively.

The figures in the third counting, when compared with those in the first and second counting, respectively, exhibited a decrease in the toxicity of almost all insecticides, except by concentrate (I) in the first counting. Insecticide (X) seemed to have similar kill percentage in both the second and third counting.

As regards the degree of killing efficiency of the insecticides when compared with one another, the order of kill percentage was not stable in each of the three countings, but taking the average kill percentage of each insecticide for all three countings as a measure for comparing the toxicity of insecticides, the following descending order could be arranged :

(A) P.31 Emulsion Psylortox, 1% oil + 0.1% D.D.T. (IX) ; (B) P.31 Miscible oil, 1% oil + 0.05% D.D.T. (XII) ; (C) (a) P.31 Emulsion, 1% oil + 0.05% D.D.T. (X) ; (b) Agrocide III liquid 0.05% Gamma (XXIII) ; (c) P.31 Miscible oil Psylortox, 1% oil + 0.1% D.D.T. (XI) ; (D) (a) Pestox, 0.1% D.D.T. (XIII) ; (b) Psylortox, 0.05% D.D.T. (VIII) ; (E) Psylortox, 0.1% D.D.T. (VII) ; (F) Paris green combination (I) ; (G) Orthodichlorbenzine combination (II) ; (H) Wood-tar caustic soda (III) ; and (I) Volck Emulsion (IV).

P.31 Emulsion Psylortox with a higher concentration (IX) gave better killing efficiency than P.31 Emulsion with a lower one (X). On the contrary, P.31 Miscible oil with a smaller dose (XII) gave better results than P.31 Miscible oil Psylortox with a larger dose (XI). The new insecticides proved generally to have better toxicity and more lasting residual effect than the old ones.

By comparing the figures in Table II in the second counting of thrips with those in the first, respectively, there was a gradual decrease of kill percentage by all the insecticides, associated with an increase of population at the second counting, ten days after the second application. In the case of Wood tar caustic soda insecticide (III), the number of thrips in the treated plots was even more than that in the check plots. The figures in the third counting when compared with those in the second respectively, showed a gradual increase in the kill percentage with the exception of P.31 Emulsion Psylortox (IX), while when compared with those of the first counting, a gradual decrease was, on the contrary, noticed in all the insecticides. By taking the degree of killing efficacy into consideration, the order of the insecticides was not the same in each of the three countings. But by considering the average kill percentage of each insecticide for all three countings, the descending order of the insecticides could be put in the following range :

(A) (a) Agrocide III liquid (XXIII), (b) Pestox (XIII) ; (B) (a) P.31 Emulsion (X), (b) P.31 Miscible oil (XII) ; (C) (a) P.31 Miscible oil Psylortox (XI). (b) P.31 Emulsion Psylortox (IX) ; (D) Psylortox (double con-

centration) (VII) ; (E) Psylortox (single concentration) (VIII) ; (F) Orthodichlorbenzine-soap-Jeyes fluid (II) ; (G) Paris green combination (I) ; (H) Wood-tar caustic soda (III) ; (I) Volck Emulsion (IV).

TABLE II

Two-application Test 1946

NUMBER OF INSECTICIDE USED	KILL PERCENTAGE BY COUNTINGS			
	First	Second	Third	Average
(I)	60.5	23.3	40.7	41.5
(II).........	71.6	13.3	47.9	44.3
(III)........	58.0	00.0	34.3	30.8
(IV)	45.1	11.3	12.9	23.1
(VII)	86.1	38.0	66.4	63.5
(VIII).......	84.3	18.0	55.0	52.4
(IX)	91.2	64.7	60.7	72.2
(X).	93.8	64.7	78.6	79.1
(XI)........	92.9	55.3	70.0	72.7
(XII)	94.8	56.7	84.3	78.6
(XIII)	93.1	78 0	82.1	84.4
(XXIII)	98.0	68.0	87.1	84.4

According to this arrangement, P.31 Emulsion (X) and also P.31 Miscible oil (XII), both with the smaller concentration, gave a better killing efficiency than the respective insecticides with the large concentration (IX) and (XI), respectively. Psylortox, on the contrary, secured better results of kill percentage with a higher dosage (VII) than with a lower one (VIII). P.31, either in Emulsion (X) or in miscible oil (XII) form had practically the same toxicity.

By comparing the figures denoting the kill percentage of the insecticides after one application with those after two applications, respectively, the killing efficiency of each insecticide was obviously higher after the latter than after the former, in both the first and third counting with the exception of insecticide (IX) in the third counting. By insecticide (I), the killing efficiency in the third counting was practically the same for both one application and two applications. In the second counting the figures were, on the contrary, less after two applications than those after one, respectively, with two exceptions, i.e., by insecticide Pestox (XIII) and Agrocide III liquid (XXIII). Insecticide P.31 Emulsion (X) showed practically similar kill percentage after one and two applications.

By considering the average kill percentage of each insecticide for all three countings of thrips, and by regarding the difference in the killing efficiency between one and two applications, the value of one more treatment could be illustrated in the following :

(a) Pestox (XIII) secured more toxicity after two applications than after one, producing a difference in the killing efficiency of about 63% in proportion to the kill percentage after one application.

(b) Orthodichlorbenzine combination (II), Psylortox (VII), and Volck Emulsion (IV), gave by two applications, 36%, 36%, and 31% more kill, respectively.

(c) Agrocide III liquid (XXIII) gained by two applications 25% more kill percentage.

(d) P.31 Emulsion (X) gained by two applications 15% more kill percentage.

(e) Wood-tar caustic soda (III), P.31 miscible oil Psylortox (II), Psylortox (VIII), P.31 miscible oil (XII), and Paris green combination (I), secured by two applications 9%, 9%, 6%, 6%, and 6% more kill percentage, respectively.

(f) P.31 emulsion Psylortox (IX) was the only insecticide by which the killing efficiency after two applications was less than that after one, by about 7% in proportion to kill percentage after one application.

No harm was done to the plants by using the above mentioned insecticides with the applied concentrations, neither after one or two applications.

In 1947 the old insecticides from (I) to (IV), which were tested last year, were tried again. Psylortox alone, or in combination with either P.31 emulsion or P.31 miscible oil, and also Pestox, all belonging to Cambridge Pest Control, and also Agrocide III liquid of the I.C.I., were dropped from the test this year owing to lack of material. Instead of these new insecticides, the following ones were chosen :

Gesarol wettable, 1% concentration (XIV) ; Gesarol wettable, 0.5% concentration (XV) ; Geigy 33 liquid, 0.25% concentration (XVII) ; Geigy 33 liquid, 0.125% concentration (XVIII) ; Agrocide wettable, 0.4% concentration (XXIV) ; Agrocide wettable, 0.2% concentration (XXVI) ; Albolinum + 666, 2% concentration (XXVIII) ; and Albolinum + 666, 1% concentration (XXIX).

The results of the killing efficiency of the tested insecticides are given in percentages in Table III.

By comparing the figures in Table III in the second counting with those in the first respectively, a noticeable increase was seen in the killing efficiency of all the old insecticides and also of insecticide (XIV), amongst the new ones. By the insecticides (XV), (XVIII), (XXIV), (XXIX) and (XXVIII) there was, on the contrary, a marked decrease in their toxicity. Insecticides (XVII) and (XXVI) showed almost similar kill percentage, respectively.

TABLE III

One-application Test 1947

NUMBER OF INSECTICIDE USED	KILL PERCENTAGE BY COUNTINGS			
	First	Second	Third	Average
(I)	60.4	81.3	67.4	69.7
(II)........	69.3	74.1	66.0	69.8
(III)........	45.0	80.5	62.5	61.7
(IV)........	60.9	80.7	64.5	68.7
(XIV).......	80.2	91.4	60 6	77.5
(XV).......	75.7	68.9	72.4	72.3
(XVII)......	86.2	84.4	70.7	80 4
(XVIII).....	71.2	58 4	65.0	64.9
(XXIV).....	85.4	53.4	77.4	72.1
(XXVI).....	80.6	78.6	79.7	79.6
(XXVIII)....	71.1	48.8	57.7	59.2
(XXIX).....	88.0	46 8	69.9	68.2

The figures in the third counting, when compared with those in the first respectively, showed an increase in the killing efficiency of the insecticides (I, II and IV) amongst the old ones, while on the contrary they showed a decrease in the toxicity of all other insecticides, with the exception of the insecticide (XXVI), which proved to have similar kill percentage in both countings.

When the figures in the third counting were compared with those in the second, respectively, there was a decrease in the killing efficiency of all the old insecticides and also of both new insecticides (XIV) and (XVII), while there was on the contrary, an increase in the toxicity of the insecticides (XV), (XVIII), (XXIV), (XXIX) and (XXVIII) respectively. Insecticide (IX) secured similar kill percentage in both countings.

The order of the insecticides, when compared with one another with regard to the toxicity of each, was not stable in the three countings of thrips. But by considering the average kill percentage of all three countings of each insecticide the following descending range could be made :

(A) (a) Geigy 33 liquid, 0.25% concentration (XVII), (b) Agrocide wettable, 0.2% concentration (XXVI) ; (B) Gesarol wettable, 1% concentration (XIV) ; (C) (a) Gesarol wettable, 0.5% concentration (XV), (b) Agrocide wettable, 0 4% concentration (XXIV) ; (D) (a) Orthodichlorbenzine combination (II), (b) Paris green combination (I) ; (E) (a) Volck-may-oil Emulsion (IV), (b) Albolinum with 666, 1% concentration (XXIX) ; (F) Geigy 33 liquid, 0.125% concentration (XVIII) ; (G) Wood-tar caustic soda (III) ; (H) Albolinum + 666, 2% concentration (XXVIII).

Amongst the new insecticides, Geigy 33 liquid (XVII) and Gesarol wettable (XIV), both with higher concentrations, gave better toxicity than those with lower ones, (XVIII) and (XV), respectively, while Agrocide wettable (XXVI) and Albolinum + 666 (XXIX) gave, on the contrary, higher killing efficiency with smaller dosages than with larger ones, (XXIV) and (XXVIII) respectively.

Some of the old insecticides, still seemed to compete with some other new insecticides with high toxicity namely, Orthodichlorbenzine (II), Paris green combination (I) and Volck emulsion (IV) with Albolinum + 666 (XXIX) and Geigy 33 liquid (XVIII) ; Wood tar caustic soda (III) with Albolinum + 666 (XXVIII).

TABLE IV

Two-application Test 1947

NUMBER OF INSECTICIDE USED	KILL PERCENTAGE BY COUNTINGS			
	First	Second	Third	Average
(I)	83.8	80.8	65 3	76.6
(II).........	86.6	85.3	73.3	81.7
(III)	84.2	77.2	63.5	74.8
(IV)	86.3	83.2	70.6	80.0
(XIV).......	96.9	93.5	91.2	93.9
(XV)........	94.8	91.1	83.6	89.8
(XVII)......	91.8	87.0	78.2	85.7
(XVIII)	92.3	86.0	77.1	85.1
(XXIV)	92.1	92.7	90.8	91.9
(XXVI)	92.2	94.0	91.2	92.5
(XXVIII)....	87.1	87.4	76.7	83.7
(XXIX)	89.5	87.0	78.6	85.0

The figures in the second counting in Table IV, when compared with those in the first, respectively, indicated a slight decrease in the toxicity of the majority of the insecticides. Agrocide wettable (XXVI) was contradictory in this respect. Agrocide wettable (XXIV) and Albolinum + 666 (XXVIII) both secured similar kill percentage, respectively.

The figures in the third counting, when compared with those in the first and second respectively, showed a noticeable decrease in almost all insecticides. The toxicity of Agrocide wettable (XXVI) and (XXIV) both practically did not change in all three countings.

As regards the degree of toxicity, the insecticides, when compared with one another, did not retain the same position in the order of kill percentage in each of the three countings. But by taking the average kill percentage of each insecticide for all three countings, the following descending order could be arranged :

(A) Gesarol wettable, 1% concentration (XIV); (B) (a) Agrocide wettable, 0.2% concentration (XXVI), (b) Agrocide wettable, 0.4% concentration (XXIV); (C) Gesarol wettable, 0.5% concentration (XV); (D) (a) Geigy 33 liquid, 0.25% concentration (XVII), (b) Geigy 33 liquid, 0.125% concentration (XVIII), (c) Albolinum + 666, 1% concentration (XXIX), and (d) Albolinum + 666, 2% concentration (XXVIII); (E) (a) Orthodichlorbenzine combination (II), (b) Volck-May-Oil Emulsion (IV); (F) (a) Paris green combination (I), (b) Wood-tar caustic soda (III).

As had been already mentioned in the one application test, the new insecticides, Gesarol wettable (XIV) and Geigy 33 liquid (XVII) both with higher concentrations, gave also in the two application test, better killing efficiency than those with lower ones, (XV) and (XIV), respectively; while Agrocide wettable (XXVI) and Albolinum + 666 (XXIX), gave on the contrary, higher kill percentage with smaller doses than those, (XXIV) and (XXIX), with larger doses, respectively. As regards the degree of toxicity after two applications, the old insecticides appeared at the bottom of the descending order of kill percentage.

In 1948 the field tests were confined to new insecticides only, including the following ones:

Gesarol wettable, 1% concentration (XIV); Gesarol wettable, 0.5% concentration (XV); Gesarol Dust (XVI); Geigy 33 liquid, 0.25% concentration (XVII); Geigy 33 liquid, 0.125% concentration (XVIII); Neocide wettable, 0.1% concentration (XIX); John Powel, 0.1% concentration (XXI); John Powel, 0.05% concentration (XXII); Agrocide wettable, 0.3% concentration (XXV); Agrocide wettable, 0.2% concentration (XXVI); Agrocide III Dust (XXVII); Albolinum + 2% 666, 2% concentration (XXVIII); Albolinum + 2% 666, 1% concentration (XXIX); Vapotone, 0.1% concentration (XXX); E 605 f, 0.04% concentration (XXXI); E 605 f, 0.02% concentration (XXXIII); and E 605 Dust (XXXV).

According to the unfavourable climatic conditions in 1948, application of insecticides against thrips attacking cotton seedlings, was delayed about three weeks than usual, due to retardation of growth and emergency of thrips. The whole test lasted about one month (May 5th to June 5th) within also one generation of *Thrips tabaci*, as could be noticed from the average number of thrips counted in the check plots during this period, with the following results:

Date of countings	6.V.1948	15.V.1948	25.V.1948	5.VI.1948
Average number of Thrips	398	176	136	82

The average number of holes of cotton seedlings was only about 80%, and the damage of cotton seedlings attributed to thrips was almost 5%.

The results of the field tests were recorded as follows in Table V for the one-application test, and in Table VI for the two-application test.

TABLE V

One-application Test 1948

NUMBER OF INSECTICIDE USED	KILL PERCENTAGE BY COUNTINGS			
	First	Second	Third	Average
(XIV).......	90.4	35.1	12.6	46.0
(XV)........	88.1	27.6	14.6	43.4
(XVI).......	92.9	5.2	26.5	41.5
(XVII)......	88.9	23.6	25.2	45.9
(XVIII)......	85.7	16.1	00.0	33 9
(XIX).......	88.7	25.3	7.9	40.6
(XXI).......	87.7	25.3	32.4	48.5
(XXII)......	87.1	12.1	15.2	38.1
(XXV)......	90.4	25.3	13.2	43 0
(XXVI)......	89.9	22.4	19.2	43.8
(XXVII).....	93.9	23.6	2.6	40.0
(XXVIII)....	91.4	23.6	19.2	44.7
(XXIX)......	89.7	31.6	7.3	42.9
(XXX)......	88.1	7.5	19.2	38.3
(XXXI)......	99.7	81.6	—	90.6
(XXXIII)....	99.2	92.6	—	95.9
(XXXV).....	98.9	—	—	98.9

By comparing the figures in the second counting in Table V with those in the first, respectively, a strongly marked decrease of toxicity was noticed in all insecticides, except in the case of E 605 f in which the decrease of toxicity at both concentrations, (XXXIII) and (XXXI), was comparatively small. The figures in the third counting when compared with those in the second, respectively, showed also a continuous decrease of toxicity of almost all insecticides with the exception of John Powel (XXII) and (XXI), Vapotone (XXX) and Gesarol Dust (XVI).

As regards the degree of toxicity, the insecticides, when compared with one another, and according to the average kill percentage of each insecticide of all three countings, could be put in the following descending range :

(A) E 605 Dust (XXXV) ; (B) E 605 f., 0.02% concentration (XXXIII) ; (C) E 605 f, 0.04% concentration (XXXI) ; (D) John Powel, 0.1% concentration (XXI) ; (E) (a) Gesarol wettable, 1% concentration (XIV), **(b) Geigy** 33 liquid, 0.25% concentration (XVII) ; (F) Albolinum + 666, 2% concentration (XXVIII) ; (G) (a) Agrocide wettable, 0.2% concentration (XXVI), (b) Gesarol wettable, 0.5% concenrtation (XV), (c) Agrocide wettable, 0.3%

concentration (XXV); (d) Albolinum + 666, 1% concentration (XXIX); (H) Gesarol Dust (XVI); (I) Neocide wettable, 0.1% concentration (XIX), (b) Agrocide III Dust (XXVII); (J) (a) Vapotone, 0.1% concentration (XXX), (b) John Powel wettable, 0.05% concentration (XXII); (K) Geigy 33 liquid, 0.125% concentration (XVIII).

It was also noticed that John Powel (XXI), Gesarol (XIV), Geigy 33 liquid (XVII), and Albolinum + 666 (XXVIII), with a higher concentration gave better results than those with a lower one, (XXII), (XV), (XVIII) and (XXIX), respectively. Insecticides E 605 f (XXXIII) and Agrocide wettable (XXVI) gave on the contrary, with a smaller dose, better killing efficiency than those with bigger doses, (XXXI) and (XXV), respectively.

TABLE VI

Two-application Test 1948

NUMBER OF INSECTICIDE USED	KILL PERCENTAGE BY COUNTINGS			
	First	Sceond	Third	Average
(XIV).......	93.8	5.0	72.0	56.9
(XV)	90.0	13.2	75.6	59.6
(XVI).......	94.9	13.2	76.8	61.6
(XVII)	93.8	20.7	73.2	62.6
(XVIII)......	93.3	00.0	61.0	51.4
(XIX)	94.4	31.4	70.0	65.3
(XXI)	92.2	00.0	68.3	53.5
(XXII)	88.2	00.0	72.0	53.4
(XXV)	94.9	33.9	68.3	65.7
(XXVI)......	94.4	24.8	68.3	62.5
(XXVII)	94.9	33.9	78.0	65.6
(XXVIII).....	93.9	31.4	73.2	66.2
(XXIX)......	94.9	33.1	70.7	66.2
(XXX)	91.9	18.1	72.0	60.7
(XXXI)......	98.3	*	*	98.3
(XXXIII)	98.9	*	*	98.9
(XXXV).	**	**	**	**

* Counting of thrips in the concerned plots was forgotten by mistake.
** E 605 Dust was dropped from the two-application test due to lack of material.

The figures of the second counting of Table VI, when compared with those of the first, respectively, exhibited an amazing decrease in the killing efficiency of all insecticides associated with an increase of the population of thrips. The figures in the third counting, when compared with those in the first, showed a natural decrease of toxicity of all insecticides, but when

compared with those of the second counting, respectively, they showed an obvious increase in the killing efficiency of all the insecticides.

As regards the degree of toxicity, the insecticides, when compared with one another, and taking the average kill percentage of each insecticide for all three countings, as a measure for comparison, could be put in the following descending order :

(A) (a) E 605 f. 0.02% concentration (XXXIII), (b) E 605 f, 0.04% concentration (XXXI) ; (B) (a) Albolinum + 666, 1.0% concentration (XXIX), (b) Albolinum + 666, 2.0% concentration (XXVIII) ; (C) (a) Agrocide wettable, 0.3% concentration (XXV), (b) Agrocide III Dust (XXVII), (c) Neocide wettable, 0.1% concentration (XIX) ; (D) (a) Geigy 33 liquid, 0.25% concentration (XVII), (b) Agrocide wettable, 0.2% concentration (XXVI), (c) Gesarol Dust (XVI) ; (E) (a) Vapotone, 0.1% concentration (XXX), (b) Gesarol wettable, 0.5% concentration (XV) ; (F) Gesarol wettable, 1.0% concentration (XIV) ; (G) (a) John Powel, 0.1% concentration (XXI), (b) John Powel, 0.05% concentration (XXII) ; (H) Geigy 33 liquid, 0.125% concentration (XVIII).

From the above arrangement one could see that there was no difference in the killing efficiency between higher and lower concentrations of the insecticides E 605 f (XXXIII and XXXI), Albolinum + 666 (XXIX and XXVIII), John Powel wettable (XXII and XXI).

Agrocide wettable and Geigy 33 liquid, both with a higher concentration (XXV) and (XVII), gave better toxicity than with a lower one (XXVI) and (XVIII), respectively, while Gesarol wettable was contradictory in this respect (XIV) and (XV).

The figures denoting the killing efficiency of insecticides were, after two applications, higher than those after one application. By considering the average kill percentage of each insecticide for all three countings of thrips, and by regarding the difference in the toxicity between the one and two applications the value of one more treatment is explained in the following :

(a) Vapotone (XXX), Albolinum + 666 (XXIX), Agrocide wettable (XXV) and Geigy 33 liquid (XVIII), secured more toxicity after two applications than after one, making a difference in the killing efficiency of 60%, 54%, 53% and 51%, respectively, in proportion to the kill percentage after one application.

(b) Gesarol Dust (XVI), Albolinum + 666 (XXX), and Agrocide wettable (XXVI) gave by two applications 49%, 48% and 43% more kill, respectively.

(c) John Powel wettable (XXII), Neocide wettable (XIX), Geigy 33 liquid (XVII), Gesarol wettable (XV) and Agrocide III Dust (XXVII) gave after two applications 40%, 38%, 37%, 37% and 36% more kill, respectively.

TABLE VII

Old Insecticides : One-application Test

NUMBER OF INSECTICIDE USED	YEAR	KILL PERCENTAGE BY COUNTINGS			
		First	Second	Third	Average
(I)	1946 1947 Average	25.5 60.4 43.0	47.9 81.3 64.6	43.8 67.4 55.6	39.1 69.7 54.4
(II)..........	1946 1947 Average	41.8 69.3 55.6	47.4 74 1 60.8	8.1 66.0 37.0	32.4 69.8 51.1
(III).........	1946 1947 Average	30.6 45.0 37.8	40.2 80.5 60.4	13.8 62.5 38.2	28.2 61.7 45.0
(IV).........	1946 1947 Average	11.2 60.9 36.0	41.6 80.7 61.2	00.0 64.5 32.3	17.6 68.7 43.2

TABLE VIII

Old Insecticides : Two-application Test

NUMBER OF INSECTICIDE USED	YEAR	KILL PERCENTAGE BY COUNTINGS			
		First	Second	Third	Average
(I)	1946 1947 Average	60.5 83.8 72.2	23.3 80.8 52.0	40.7 65.3 53.0	41.5 76.6 59.0
(II)	1946 1947 Average	71.6 86.6 79.1	13.3 85.3 49.3	47.9 73.3 60.6	44.3 81.7 63.0
(III).	1946 1947 Average	58.0 84.2 71 1	00.0 77.2 38.6	34.3 63.5 48.9	30.8 74.8 52.8
(IV)	1946 1947 Average	45.1 86.3 65.7	11.3 83.2 47.3	12.9 70.6 41.8	23.1 80.0 51.6

(d) Gesarol wettable (XIV) gained after two applications 24% more kill.

(e) John Powel (XXI), E 605 f (XXXI) and (XXXIII) secured 10%, 8% and 3% more kill, respectively.

The greater the difference in the killing efficiency between one and two applications of a certain insecticide, the greater the value of a second application, from the economic point of view.

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In the following paragraphs, the respective figures of all percentage of the same insecticides tested twice in the two years, will be compared with one another in each counting, in order to study the effect of climatic conditions on these insecticides during a three weeks interval every season. All the old insecticides were tested in 1946 and 1947. As regards the new insecticides, some were tested once and some twice. Those tested twice were tried in 1947 and 1948. The figures of kill percentage of the old insecticides are recorded in Table VII and in Table VIII, while those of the new ones are given in Table IX and in Table X. Table VII and Table IX deal with the results of the one application tests while Table VIII and Table X with the two application tests.

The figures showing the toxicity of the new insecticides, tested once in 1946 and in 1948, are not included in these tables, as they have already been discussed.

The old insecticides include :

Paris green combination (I); Orthodichlorbenzine combination (II); Wood-tar caustic soda (III); Volck emulsion (IV).

The new insecticides contain :

Gesarol wettable, 1% concentration (XIV); Gesarol wettable, 0.5% concentration (XV); Geigy 33 liquid, 0.25% concentration (XVII); Geigy 33 liquid, 0.125% concentration (XVIII); Agrocide wettable, 0.4% concentration (XXIV); Agrocide wettable, 0.2% concentration (XXVI); Albolinum + 2% 666, 2% concentration (XXVIII); Albolinum + 2% 666, 1% concentration (XXIX).

By studying the figures of kill percentage in Table VII and in Table VIII, respectively, one could easily notice that the toxicity of the old insecticides was, in general, less in 1946 than in 1947, in each of the three countings of the thrips, in the one- and also the two- application tests. This fact was due to the unfavourable climatic conditions in 1946, during which the weather was rather moist, and the temperature lower than normal, thus causing the toxicity of the insecticides in that year to be less than in 1947, as will be explained afterwards.

The increase of killing efficiency of the old insecticides in the second counting, in proportion to the first, in the one-application test in both 1946 and 1947, can be explained by the fact, that the toxicity seemed not to

have reached its height in the first counting, carried out only one day after application, and that if counting had been continued for several days, the toxicity would certainly have shown a gradual increase, part of which appeared in the second counting, made ten days after application. In the two-application test, instead of an increase, there was, on the contrary, a decrease of toxicity in the second counting, in proportion to the first in 1946. This was attributed to the unfavourable climatic conditions in that year, during which rain fell after treatment, causing a partial wash-off of the insecticides from the plants, and diluting the insecticidal residue, thus reducing its killing efficiency.

In 1947, in the two-application test, there was a slight decrease of no significance in the kill percentage in the second counting, in proportion to the first. In that year, the climatic conditions were normal, and the killing efficiency appeared nearly to have reached its maximum in the first counting, most probably through accumulation of the insecticides by double treatment. The residue retained its toxicity in the second counting at nearly the same level as in the first counting. In the third counting, in the one-application test in 1946, and in both the one and two-application tests in 1947, there was a gradual decrease in the toxicity of the old insecticides, in proportion to those of the first and second counting. This event was quite normal as the insecticides were exposed, during twenty days interval, to the effect of climatic conditions, such as light, sun heat, rain, air, etc., and therefore subjected to slow dilution, wash-off and decomposition. The exception to the last mentioned cases occured in the third counting of the two-application test in 1946, as instead of a gradual decrease, there was a gradual increase of kill percentage of the old insecticides. It has already been mentioned, that rain, in that year, affected the killing efficacy in the second counting of the two-application test. In the period following this counting, the weather became dry, causing the insecticidal residue to concentrate and thus regain some of its toxicity, a fact which could explain the increase of kill percentage in the third counting, in proportion to the second.

According to the average kill percentage of all three countings of thrips of both 1946 and 1947, the descending range of the old insecticides in the one-application test, being :

(A) Paris green combination; (B) Orthodichlorbenzine combination; (C) Wood tar caustic soda; and (D) Volck emulsion.

In the two-application test, the descending order of the insecticides is nearly the same as in the one-application, with the exception that Orthodichlorbenzine preceeds Paris green combination.

As regards quickness of toxic action, Orthodichlorbenzine combination, seemed to be the first, while Paris green combination, wood tar caustic soda and Volck emulsion followed, respectively, as could be noticed in the average kill percentage of the first counting in the one- and also the two-application tests in 1946 and 1947.

Taking the residual lasting effect into consideration, Paris green combination appeared to be the best in this respect, in the one application test, while Wood-tar caustic soda, Orthodichlorbenzine combination and Volck emulsion followed, respectively. In the two-application test, Orthodichlorbenzine combination preceded all the other insecticides, which then followed successively in the range as in the one-application test.

According to the average kill percentage of all three countings of 1946 and 1947, the toxicity of the old insecticides increased in the two-application test, in proportion to the one-application, by the following percentages :

(A) Orthodichlorbenzine (II), 23.3%; (B) Volck emulsion (IV) and Wood-tar caustic soda (III), 19.4% and 17.3%, respectively; (C) Paris green combination (I), 8.3%.

It seemed that the difference in kill percentage between one- and two-applications, in the case of unstable old contact insecticides (II, III and IV), was proportionally greater than in the case of old ones of a more stable nature (I).

According to the average kill percentage of the third counting of 1946 and 1947, the old insecticides, after a three weeks interval, still showed a residual toxicity varying from 32% to 56% in the one application test, and from 42% to 61% in the two-application test.

By studying the figures of toxicity of those new insecticides tested in two years and recorded in Table IX and in Table X, the author made the following observations :

(1) As regards the figures in the second, and also third counting, when compared with those in the first, there was a gradual decrease of killing efficacy in almost all insecticides, in the one- and also the two-application tests, in both 1947 and 1948. The differences in the decrease of toxicity between the figures in the first counting, and those in the second or third, were propoprtionally small in 1947, but great in 1948.

(2) With regard to the figures in the second counting, when compared with those in the third, there was a contradictory behaviour in this respect, namely : there was a gradual increase in the toxicity of almost all insecticides in the one-application test in 1947, and also in the two-application test in 1948; while there was a gradual decrease of kill percentage in the two-

TABLE IX

New Insecticides : One-application Test

NUMBER OF INSECTICIDE USED	YEAR	KILL PERCENTAGE BY COUNTINGS			
		First	Second	Third	Average
(XIV)	1947	80.2	91.4	61.6	77.5
	1948	90.4	35.1	12.6	46.0
	Average	85.3	63.3	37.1	61.8
(XV)	1947	75.7	68.9	72.4	72.3
	1948	88.1	27.6	14.6	43.4
	Average	81.9	48.3	43.5	57.9
(XVII)........	1947	86.2	84.4	70.7	80.4
	1948	88.9	23.6	25.2	45.9
	Average	87.6	54.0	48.0	63.2
(XVIII).	1947	71.2	58.4	65.0	64.9
	1948	85.7	16.9	00.0	33.9
	Average	78.5	37.3	32.5	49.4
(XXIV)	1947	85.4	53.4	77.4	72.1
	1948	90.4	25.3	13.2	43.0
	Average	87.9	39.4	45.3	57.6
(XXVI)	1947	80.6	78.6	79.7	79.6
	1948	89.9	22.4	19.2	43.8
	Average	85.3	50.5	49.5	61.7
(XXVIII)	1947	71.1	48.8	57.7	59.2
	1948	91.4	23.6	19-2	44.7
	Average	81.3	36.2	38.5	52.0
(XXIX)	1947	88.0	46.8	69.9	68.2
	1948	89.7	31.6	7.3	42.9
	Average	88.9	39.2	38.6	55.6

application test in 1947, and also in the one-application test in 1948. The differences in the increase or decrease between the figures in the second and third countings were also proportionally small in 1947 and great in 1948.

The fluctuation in the killing efficiency in the second counting, in its relation to the third, was due to different factors amongst which the following are worth mentioning :

(a) Disturbance of natural equilibrium in the relation between insects and their natural enemies, occuring through interference of unfavourable factors, could, in our tests, be responsible for the apparent decrease in the

TABLE X

New Insecticides : Two-application Test

NUMBER OF INSECTICIDE USED	YEAR	KILL PERCENTAGE BY COUNTINGS			
		First	Second	Third	Average
(XIV)	1947	96.9	93.5	91.2	93.9
	1948	93.8	5.0	72.0	56.9
	Average	95.4	49 3	81 6	75.4
(XV).........	1947	98.8	91.1	83.6	89.8
	1948	90.0	13.2	75.6	59.6
	Average	94.4	52.2	79.9	74.7
(XVII)........	1947	91.8	87.0	78.2	85.7
	1948	93.8	20.7	73.2	62.6
	Average	92.8	53.9	75.7	74.2
(XVIII)	1947	92.3	86.0	77.1	85.1
	1948	93.3	00.0	61.0	51.4
	Average	92.8	43 0	69.0	68.3
(XXIV)........	1947	92.1	92.7	90.8	91.9
	1948	94.9	33.9	68.3	65.7
	Average	93.5	63.3	79.6	78.8
(XXVI)	1947	92.2	94.0	91.2	92.5
	1948	94.4	24.8	68.3	62.2
	Average	93.3	59 4	79.8	77.5
(XXVIII)	1947	87.1	87.4	76.7	83.7
	1948	93.9	31.4	73.2	66.2
	Average	90.0	59.4	75.0	75.0
(XXIX)	1947	89.5	87.0	78.6	85.0
	1948	94.9	33·1	70.7	66.2
	Average	92.2	60.0	74.7	75.6

kill percentage of the insecticides. After treatment a large number of parasites and predators were either directly or indirectly killed together with their insect hosts, thus causing a rapid increase of the surviving and also of the newly emerged insects in the period after treatment, before their natural enemies could get the chance to develop. The second counting of thrips, being carried out ten das after treatment, exhibited an apparent decrease of killing efficiency through a rapid and an unexpected increase of population of thrips. In the ten days interval following the second counting the disturbance of natural equilibrium was again balanced, and the insect-

icidal residue appeared to have regained its toxicity as has already been noticed in the third counting.

(b) Climatic conditions were also one of the causes of the decrease in the kill percentage of the insecticides. When rain fell after treatment, the figures indicating killing efficiency, showed a decrease in the second counting, as a result of a partial wash-off and a dilution of the insecticidal residue. Other factors causing a decrease in the toxicity of the insecticides were sun heat, air, light, etc., as they most probably caused a decomposition of the insecticides during a period of about three weeks after treatment.

(c) In the period following application of the insecticides, new growths of leaves, as well as newly grown patches in the leaves, were free from any trace of the insecticides, and therefore offered a safe field for the insects to feed on without getting injured, consequently reducing the killing efficiency of the insecticides.

(d) Higher concentrations of the insecticides increased their toxicity, always providing that no harm was done to the plants through these higher doses.

(e) Accumulation of the active elements through repetition of the application of the insecticides caused an increase of toxicity. Accumulation, at the same time, should by no means exceed a certain limit above which the plants might get injured.

(f) Penetration of the insecticides through the epidermis into the plant tissue, increased their toxicity against these sucking insects as long as these insecticides did not undergo a decomposition inside the plant tissue. The toxicity would increase even more, if after absorbtion, the insecticides came in contact with the cell sap, thus being widely circulated through the whole plant.

The fact that the difference of kill percentage between the figures in the second and those in the third counting was greater in 1948 than in 1947, was attributed to the unfavourable climatic conditions in 1948. In addition to the increase of population of thrips, during the first ten days interval after treatment, rain fell shortly before the second counting was carried out, consequently causing a dilution and also a partial wash-off of the insecticidal residue.

These two factors working hand in hand reduced the kill percentage of the insecticides in the second counting in 1948 in comparison to that in 1947, during which no rain fell in that period. The unfavourable climatic effect on the insecticides was more noticeable in the one-application than in the two-application test, as a result of the accumulated insecticidal residue

through double treatment, which proportionally compensated the loss through its reaction to the bad effect of the unfavourable weather conditions. In the ten days interval following the second counting, and during which rain did not fall, the insecticidal residue dried up, concentrated and partially regained its toxicity, as was noticed in the third counting in the two-application test in 1948. But in the one-application test in that year, rain fell in the second interval following the second counting, and a dilution and also a partial wash-off of the insecticidal residue occured, thus reducing the kill percentage in the third counting.

In 1947, in the two-application test, the figures of killing efficacy in the third counting showed a slight decrease of toxicity in comparison to those in the first and second counting. The differences in the kill percentage between the three countings were, however, insignificant, and the residue of almost all insecticides appeared to have a more lasting and a markedly higher toxicity in that normal year than in 1948. According to the authors observations and conclusions, climatic conditions played one of the important factors, if not the most, affecting the toxicity of both the insecticides and their residue.

In the previous paragraphs, the author discussed the figures indicating the killing efficacy of both the old and new insecticides, with the aim of answering various questions, namely :

(1) Which of the insecticides has the best toxicity ?

(2) Which of them has the most lasting residual effect ?

(3) How do the climatic conditions affect the insecticides and their residue ?

(4) Which concentration of the insecticides is recommended ?

(5) How many applications are necessary to gain the best control of insects during the whole season of infestation ?

(6) What is the economic value of each insecticide with regard to the expenses of insect control and the increase of yield through treatment ?

(7) What is the effect of the insecticides on the plant, on one hand, and on man and animal, on the other ?

The questions referred to under items 1 to 5 have already been studied in the previous paragraphs. Regarding the estimation of economic value of insecticides by means of comparing the yield of each with that of the check plots, and calculating the expenses of treatment and the increase of yield thereof, this was in the case of cotton, not easy to solve, through the interference of many other dangerous insects, i.e., aphis, cotton leaf-worm, and cotton boll-worms which attack cotton in the period following thrips in-

festation, and which enormously influence the cotton yield, especially if the control of one or more of these insects is neglected.

As far as our field tests are concerned, no harm was done to cotton plants by using the applied concentrations and number of applications. The question of studying penetration of insecticides through the epidermis, accumulation of insecticides in and outside the plant tissue, circulation of the absorbed insecticides with the cell sap through the plant, internal and external injury to plant, animal and men, stableness, partial or complete decomposition of the insecticides in and outside the organism, etc., all these problems cannot be solved under field conditions, but need exact laboratory experiments, which the author does not intend to discuss in this paper.

Taking the average kill percentage of the insecticides of all three countings of both 1947 and 1948 as a measure for comparison, the descending order of toxicity of the new insecticides will be as follows :

(A) *One-application Test*

(A) Geigy 33 liquid, 0.25% concentration (XVII) ; (B) (a) Gesarol wettable, 1% concentration (XIV), (b) Agrocide wettable, 0.2% concentration (XXVI) ; and (C) (a) Gesarol wettable, 0.5% concentration (XV), and (b) Agrocide wettable, 0.4% concentration (XXIV) ; (D) Albolinum + 2% 666, 1% concentration (XXIX) ; (E) Albolinum + 2% 666, 2% concentration (XXVIII) ; (F) Geigy 33 Liquid, 0.125% concentration (XVIII).

(B) *Two-application Test*

(A) (a) Agrocide wettable, 0.4% concentration (XXIV), and (b) Agrocide wettable, 0.2% concentration (XXVI) ; (B) (a) Albolinum + 2% 666, 1% concentration (XXIX), (b) Gesarol wettable, 1% concentration (XIV), (c) Albolinum + 2% 666, 2% concentration (XXVIII), (d) Gesarol wettable, 0.5% concentration (XV), and (e) Geigy 33 liquid, 0.25% concentraiton (XVII) ; (C) Geigy 33 liquid, 0.125% concentration (XVIII).

According to the above mentioned range of the new insecticides, no difference in the kill percentage between higher and lower concentrations was practically noticed in the two-application test, with the exception of Geigy 33 liquid. The difference in the toxicity of insecticides, when compared with one another in the same test, was insignificant. In the one-application test, Geigy 33 liquid and Gesarol wettable showed more kill percentage at higher concentrations than at lower ones, while Agrocide wettable and Albolinum with 2% 666 secured, on the contrary, less toxicity at higher doses than at lower ones.

As regards the average kill percentage of all three countings of the insecticides in 1947 and 1948, the killing efficacy in the two-application test was comparatively more than that in the one-application test. The increase

of toxicity in the two-application test in proportion to that of the one application is illustrated in percentages in the following :

(A) Albolinum with 2% 666 (XXVIII), 44.2%; (B) Geigy 33 liquid (XVIII), Agrocide wettable (XXIV) and Albolinum with 2% 666 (XXIX), 38.2%, 36.8%, and 36%, respectively; (C) Gesarol wettable (XV), Agrocide wettable (XXVI) and Gesarol wettable (XIV), 29%, 25.6% and 22% respectively; (D) Geigy 33 liquid (XVII), 17.4%.

Taking quick toxic action into consideration and according to the average kill percentage of the first counting in 1947 and 1948, the new insecticides can be arranged in the following descending order :

(A) *One-application Test*

(A) (a) Albolinum + 2% 666, 1% concentration (XXIX), (b) Agrocide wettable, 0.4% concentration (XXIV), and (c) Geigy 33 liquid, 0.25% concentration (XVII); (B) (a) Gesarol wettable, 1% concentration (XIV), and (b) Agrocide wettable, 0.2% concentration (XXVI); (C) (a) Gesarol wettable, 0.5% concentration (XV). and (b) Albolinum with 2% 666, 2% concentration (XXVIII).

(B) *Two-application Test*

(A) (a) Gesarol wettable, 1% concentration (XIV), and (b) Gesarol wettable, 0.5% concentration (XV); (B) (a) Agrocide wettable, 0.4% concentration (XXIV), (b) Agrocide wettable, 0.2% concentration (XXVI), (c) Geigy 33 liquid, 0.25% concentration (XVII), and (d) Geigy 33 liquid, 0.125% concentration (XVIII); (C) (a) Albolinum + 2% 666, 1% concentration (XXIX), and (b) Albolinum + 2% 666, 2% concentration (XXVIII).

The descending order of the new insecticides in this respect was not the same in the one- and two-application tests, yet there was no great difference between the killing efficiency of these insecticides, both in the one- and two-application tests, when compared with one another, so that it could be said that the new insecticides were practically equal in quick toxic action.

As far as the residual lasting effect is concerned, and according to the average kill percentage of the third counting in 1947 and 1948, the new insecticides will take the following descendnig order :

(A) *One-application Test*

(A) (a) Agrocide wettable, 0.2% concentration (XXVI), and (b) Geigy 33 liquid, 0.25% concentration (XVII); (B) (a) Agrocide wettable, 0.4% concentration (XXIV), and (b) Gesarol wettable, 0.5% concentration (XV); (C) (a) Albolinum + 2% 666, 1% concentration (XXIX), (b) Albolinum + 2% 666, 2% concentration (XXVIII), and (c) Gesarol wettable, 1% concentration (XIV); (D) Geigy 33 liquid, 0.125% concentration (XVIII).

(B) *Two-application Test*

(A) (a) Gesarol wettable, 1% concentratoin (XIV), (b) Agrocide wettable, 0.2% concentration (XXVI), (c) Agrocide wettable, 0.4% concentration (XXIV), and (d) Gesarol wettable, 0.5% concentration (XV); (B) (a) Geigy 33 liquid, 0.25% concentration (XVII), (b) Albolinum + 2% 666, 2% concentration (XXVIII), and (c) Albolinum + 2% 666, 1% concentration (XXIX); (C) Geigy 33 liquid, 0.125% concentration (XVIII).

Regarding the average kill percentage of the third counting of both 1947 and 1948, the new insecticides still showed, after three weeks interval, a residual lasting effect ranging from 49 to 63.2 kill percentage in the one-application test, and from 69 to 81.6 kill percentage in the two-application test.

The residual lasting effect of the new insecticides was higher than that of the old ones, by an average difference of toxicity ranging from 12 to 50% in the one-application test, and from 33 to 66% in the two-application test, in proportion to the average kill percentage of the old insecticides, during tests carried out in a period of two years.

CHAPTER II

Insecticidal Field Tests on Onion.

In this chapter, the field tests on the old and new insecticides applied for the control of *Thrips tabaci* attacking onion, will be discussed in detail. These field tests continued from 1941 to 1949, during which the old insecticides were tried from 1941 up to 1947, and the new ones from 1946 to 1949. In 1946 and 1947 some of the old and new insecticides were examined together in parallel tests, the results of which will be recorded for the sake of comparison between their toxicity on the one hand and their nett profit on the other. After 1947, the old insecticides were cancelled, being less toxic than the new ones.

In Egypt, onion is mostly cultivated as seed-onion or set-onion, the former for producing seeds and the latter for bulbs. In August, every year, seeds are sown to give seedlings, which are picked up after sixty or seventy days and cultivated again about the middle of November to produce onion bulbs in the following April. About six months later, these bulbs are cultivated round the middle of the next November, to produce seeds in July. The cultivation of onion from seed to seed thus takes about two years time.

According to this arrangement of onion plantation, the control of thrips is usually carried out in February, on set-onion, and in March, on seed-onion. These periods of carrying out control measures are confined to Shandawil Farm in Upper Egypt, where the field tests are established and which

is considered to be the centre of a famous district of onion plantation in Egypt.

The parallel field tests for one and two applications were arranged as had already been mentioned in the first chapter. In 1946 and 1947, countings of thrips were made only once a year, 24 hours after the second treatment, as there was only one test with two applications. In 1948 and 1949, there were two parallel tests, one for one application and the other for two. As for the one-application test, only one counting of thrips was made one day after treatment, while for the two-application test two countings were made, one, 24 hours after each treatment.

The intensity of population of thrips differs with every season of the year as well as from year to year, according to the changing climatic conditions. The average number of thrips in the check plots is recorded below :

(A) *Seed-onion*

(A) ONE-APPLICATION TEST		(B) TWO-APPLICATION TEST	
Year	March 10th.	Year	March 20th.
1946......	—	1946......	451
1947......	—	1947......	2000
1948......	130	1948......	437
1949......	168	1949......	112

(B) *Set-onion*

(A) ONE-APPLICATION TEST		(B) TWO-APPLICATION TEST	
Year	February 10th.	Year	February 20th.
1948	947	1948	615
1949	36	1949	75

No more countings of thrips were made in these field tests in onion plantation, as was the case in cotton, the author being more inclined to study the effect of the insecticides applied on the onion crop, especially, as there was no interference of other insects attacking onion from the period following thrips infestation until harvesting the yield. For this purpose, all respective plots treated with a certain insecticide at a certain concentration were singly harvested and the average yield per feddan was thus calculated and then compared with that of the other insecticides and of the check as well.

(A) Field tests on seed-onion

In 1946, the following old and new insecticides were applied :

Paris green combination (I) ; Volck emulsion, 1% concentration (IV) ; Nicotine sulphate soap solution (V) ; and Gesarol wettable, 1% concentration (XIV).

TABLE XI

NUMBER OF INSECTICIDE USED	KILL PERCENTAGE	TOTAL YIELD IN KILOS	INCREASE OF YIELD	
			KILOS	PERCENTAGE
(I)...........	84.7	562	146	35
(IV)	83.3	530	141	24
(V)...........	79.8	498	22	12
(XIV)	82.5	577	161	39
Check........	—	416	—	—

According to the figures showing kill percentage calculated 24 hours after second treatment, Paris green combination (I), has the highest killing efficacy followed by Volck emulsion (IV) and Gesarol wettable (XIV). Nicotine sulphate soap solution (V), has the lowest kill percentage.

As regards the yield, Gesarol wettable (XIV) is ranged at the top followed by Paris green combination (I), Volck emulsion (IV), and Nicotine sulphate soap solution (V), respectively. The fact that the descending order of these insecticides with regard to kill percentage is not the same as that concerning the yield is due to the reaction of the plant to the different insecticides. The figures denoting the increase of yield gained by using these insecticides are obtained by deducting the yield of the check plots from that of the plots confined to each insecticide. The percentages opposite to the increase of yield show the proportion of each increase to the yield of check.

The total expenses of each insecticide, the prices of the amounts of increase of the yield gained by control and the nett profits thus available are illustrated in Table XII.

TABLE XII

NUMBER OF INSECTICIDE USED	COST OF TREATMENT IN EGYPTIAN POUNDS	VALUE OF INCREASE OF YIELD IN EGYPTIAN POUNDS	NETT PROFIT	
			EGYPTIAN POUNDS	PERCENTAGE
(I)...........	3.540	46.720	43.180	89
(IV)	1.790	36.480	34.690	72
(V)...........	4.460	26.240	21.780	45
(XIV)	3.340	51.520	48.180	100

The total expenses are calculated for two applications including the wages of labourers and hire of machines. The present price of onion seeds is Egyptian pounds 32 per 100 kilos. By deducting the expenses of control of each insecticide from the price of the amount of increase of the yield gained by control, there would still be a marked nett profit to the farmer by using these insecticides. Nicotine sulphate soap solution (V) entails the highest expenses and brings the lowest nett profit, the latter, however, being about five times as much as its total expenses of control. Gesarol wettable (XIV) and Paris green combination (I) both being comparatively still expensive, yet they bring in nett profits of nearly 14 and 12 times as much as their expenses of control, respectively. Volck emulsion (IV) involves the least expenses of control and brings in a nett profit which is 19 times as much as its expenses of control. But, as regards the total nett profit, Gesarol wettable (XIV), proved to be the best of these insecticides, and by setting 100% for its figure, the percentages of those of the others in proportion to that of Gesarol wettable (XIV) will be as already given in Table XII. Paris green combination (I) ranges second in this respect followed by Volck emulsion (IV) and lastly by Nicotine sulphate soap solution (V).

In 1947 the following insecticides were tested :

Paris green combination (I) ; Nicotine sulphate soap solution (V) ; Lime sulphur solution, 1.5% concentration (VI) ; Gesarol wettable, 1.0% concentration (XIV) ; Gesarol wettable, 0.5% concentration (XV) ; Geigy 33 liquid, 0.25% concentration (XVII) ; Geigy 33 liquid, 0.125% concentration (XVIII) ; Agrocide wettable, 0.4% concentration (XXIV) ; and Agrocide wettable, 0.2% concentration (XXVI).

TABLE XIII

NUMBER OF INSECTICIDE USED	KILL PERCENTAGE	TOTAL YIELD IN KILOS	INCREASE OF YIELD	
			KILOS	PERCENTAGE
(I)	71.5	93.6	71.6	319
(V)	46.7	45.4	23.4	110
(VI)	45.0	80.0	58.0	264
(XIV)	67.2	93.4	71.4	325
(XV)	61 7	52.8	30.8	140
(XVII)	71.2	113.2	91.2	415
(XVIII)	62.5	69.2	47.2	215
(XXIV)	77 5	185.4	163.4	743
(XXVI)	65.9	107.0	85.0	391
Check	—	22.0	—	—

As regards the kill percentage, all insecticides at higher concentrations showed more killing efficacy than their counterparts at lower ones. Nicotine

sulphate soap solution (V), and lime sulphur solution (VI) both exhibited significant low toxicity.

With regard to the increase of yield gained by control, these insecticides can be arranged in the following descending order :

Agrocide wettable, 0.4% concentration (XXIV) ; Geigy 33 liquid, 0.25% concentration (XVII) ; Agrocide wettable, 0.2% concentration (XXVI) ; Gesarol wettable, 1.0% concentration (XIV) ; Paris green combination (I) ; Lime sulphur solution, 1.5% concentration (VI) ; Geigy 33 liquid, 0.125% concentration (XVIII) ; Gesarol wettable, 0.5% concentration (XV) ; and Nicotine sulphate soap solution (V).

This descending order does not agree with that concerning kill percentage. Agrocide wettable (XXIV) gave 7.4 times as much increase of yield as the yield of the check ; Geigy 33 liquid (XVII) and Agrocide wettable (XXVI) each about 4 times ; Gesarol wettable (XIV) and Paris green combination (I) each more than 3 times ; lime sulphur solution (VI), about 2.5 times ; Geigy 33 liquid (XVIII), 2 times ; Gesarol wettable (XV) and Nicotine sulphate soap solution (V), 1.4 and 1.1 times as much increase of yield as the yield of the check, respectively.

TABLE XIV

NUMBER OF INSECTICIDE USED	COST OF TREATMENT IN EGYPTIAN POUNDS	VALUE OF INCREASE OF YIELD IN EGYPTIAN POUNDS	NETT PROFIT	
			EGYPTIAN POUNDS	PERCENTAGE
(I)..........	3.540	22.912	19.372	40
(V)..........	4.460	7.488	3.028	6
(VI)	1.480	18.560	17.080	35
(XIV)	3.340	22.848	19.508	40
(XV	2.240	9.856	7.616	15
(XVII)	3.390	29.184	25.794	53
(XVIII).	2.265	15.104	12.839	26
(XXIV).......	3.540	52.288	48.748	100
(XXVI).......	2.340	27.200	24.860	51

The climatic conditions in 1949 were most suitable for the emergence and increase of population of thrips, as could be noticed from the great number of thrips per hole in that year, in comparison to the other years. The great loss of the yield in the check plots without control in 1947, is obviously due to the great intensity of population of thrips. The yield in the treated plots was generally less than normal, due again to the same reason, although it was several times as much as the yield of the check, as has already been mentioned.

The total expenses of control, the price of the increase of yield and the nett profit thus gained are given in Table XIV.

As far as nett profit is concerned the descending order of those insecticides is the same as that of the increase of yield. Nicotine sulphate soap solution (V) proved again to be the most expensive and least profitable insecticide. Agrocide wettable (XXIV) gave the highest nett profit (100%). Geigy 33 liquid (XVII), Gesarol wettable (IV) and Paris green combination (I) practically entailed the same expenses as Agrocide wettable ((XXIV), but they brought in 53%, 40% and 40% nett profit in proportion to that of Agrocide wettable (XXIV), respectively. Agrocide wettable (XXVI), Geigy 33 liquid (XVIII) and Gesarol wettable (XV) cost nearly the same, yet they brought in different nett profits, namely, 51%, 26% and 15%, respectively. Lime sulphur solution (VI) entailed the least expenses and brought in 35% nett profit. Geigy 33 liquid (XVII) and Gesarol wettable (XIV) both had the same high concentration of D.D.T. and cost nearly the same, and yet they brought in different nett profit, i.e. 53% and 40%, respectively. Geigy 33 liquid (XVIII) and Gesarol wettable (XV) both had the same low dosage of D.D.T. and cost the same, but brought in different nett profits, namely, 26% and 15%, respectively.

In 1946 and 1947 Gesarol wettable (XIV), Paris green combination (I) and Nicotine soap solution (V) were repeatedly tested. Taking the average results of these insecticides in those two years, for the sake of comparison, the figures are given in the following Table :

NUMBER OF INSECTICIDE USED	KILL PERCENTAGE	NETT PROFIT IN EGYPTIAN POUNDS	PERCENTAGE
(I)...........	78.1	31.276	64
(V)..........	63.3	12.404	25
(XIV)........	74.9	48.464	100

Gesarol wettable (XIV) although it showed less kill percentage than Paris green combination (I) yet it brought in 1.5 times as much nett profit as the latter. Nicotine sulphate soap solution (V) proved to have the least killing eficiency and brought in only 25% nett profit in proportion to that of Gesarol wettable (XIV).

In 1948 the following insecticides were applied in the one- and two-application parallel tests as well.

Gesarol wettable, 1.0% concentration (XIV); Gesarol wettable, 0.5% concentration (XV); Gesarol Dust (XVI); Geigy 33 liquid, 0.25% concentration (XVII); Geigy 33 liquid, 0.125% concentration (XVIII); Neocide

wettable, 0.1% concentration (XIX); Neocide wettable, 0.05% concentration (XX); John Powel wettable, 0.1% concentration (XXI); Agrocide wettable, 0.4% concentration (XXIV); Agrocide wettable, 0.2% concentration (XXVI); and Agrocide III Dust (XXVII).

The results of the one-application test are indicated in Table XV.

TABLE XV

NUMBER OF INSECTICIDE USED	KILL PERCENTAGE	TOTAL YIELD IN KILOS	INCREASE OF YIELD	
			KILOS	PERCENTAGE
(XIV)	83.8	455.2	145.2	47
(XV).........	76.2	420.0	110.0	35
(XVI)........	80.0	445.2	135.2	43
(XVII)	82.3	465.2	155.2	50
(XVIII).......	77.7	505.2	195.2	63
(XIX)	83.8	435.2	125.2	40
(XX).........	74.6	525.2	215.2	69
(XXI)........	80.0	515.2	205.2	66
(XXIV).......	83.8	480.0	170.0	55
(XXVI).......	76.2	490.0	180.0	58
(XXVII)	90.8	495.2	185.2	60
Check	—	310.0	—	—

Taking kill percentage into consideration, the higher concentrations of all insecticides, namely (XIV), (XVII), (XIX) and (XXIV), gave higher killing efficacy than their lower ones, i.e. (XV), (XVIII), (XX) and (XXVI), respectively.

As regards the increase of yield gained by control, Neocide wettable (XX) gave the highest amount, i.e. 69% in proportion to the yield of the check, while Gesarol wettable (XV) brought in the least amount, 35%, although both were used at the same concentration of D.D.T.. Agrocide III Dust (XXVII) gave 60% increase of yield while Gesarol Dust (XVI) gave only 43%. John Powel wettable (XXI), Geigy 33 liquid (XVII), Gesarol wettable (XIV) and Neocide wettable (XIX) although they were applied at the same concentration of D.D.T., yet they brought in different increases of yield, namely, 66%, 50%, 47% and 40%, respectively. This fact is most probably due to : (a) the method of manufacturing these different preparations; (b) the percentage of the Para D.D.T., most active agent in each compound; and (c) the kind and quantity of the other active and inert ingredients. Neocide wettable (XX), Geigy 33 liquid (XVIII) and Agrocide wettable (XXVI), all three insecticides at lower concentrations gave greater increase of yield than their counterparts at higher dosages, namely (XIX),

(XVII) and (XXIV), respectively, Gesarol wettable with a stronger dosage (XIV), was contradictory from this point of view in comparison to its respective one with a weaker dosage (XV).

The total expenses of control, the value of the increase of yield and the nett profit thus available are recorded in Table XVI.

TABLE XVI

NUMBER OF INSECTICIDE USED	COST OF TREATMENT IN EGYPTIAN POUNDS	VALUE OF INCREASE OF YIELD IN EGYPTIAN POUNDS	NETT PROFIT	
			EGYPTIAN POUNDS	PERCENTAGE
(XIV)	1.760	46.464	44.704	65
(XV)	1.210	35.200	33.990	49
(XVI)	2.340	43.264	40.924	60
(XVII)	1.785	49.664	47.879	70
(XVIII)	1.223	62.464	61 241	89
(XIX)	0.810	40.064	39 254	57
(XX)	0.735	68.864	68.129	100
(XXI)	0.810	65.664	64.854	95
(XXIV)	1.860	54.400	52.540	76
(XXVI)	1.260	57.600	56.340	81
(XXVII)	1.040	59.264	58.224	85

As regards the nett profit, the descending order of the insecticides is as follows :

Neocide wettable, 0.05% concentration (XX) ; John Powel wettable, 0.1% concentration (XXI) ; Geigy 33 liquid, 0.125% concentration (XVIII) ; Agrocide III Dust (XXVII) ; Agrocide wettable, 0.2% concentration (XXVI) ; Agrocide wettable, 0.4% concentration (XXIV) ; Geigy 33 liquid, 0.25% concentration (XVII) ; Gesarol wettable, 1.0% concentration (XIV) ; Gesarol Dust (XVI) ; Neocide wettable, 0.1% concentration (XIX) ; and Gesarol wettable, 0.5% concentration (XV).

Neocide wettable (XX) gave the highest nett profit (100%) with the least expenses. Gesarol Dust (XVI) was the most expensive insecticide and brought in only 60 % nett profit in proportion to that of Neocide wettable (XX). Geigy 33 liquid (XVIII), Agrocide wettable (XXVI) and Gesarol wettable (XV) cost practically the same, but they brought in different nett profits, namely, 89%, 76% and 49% respectively. John Powel wettable (XXI) and Neocide wettable (XIX), although they were of the same D.D.T. concentration and involved the same expenses of control, yet they brought in different nett profits, i.e., 95% and 57%, respectively. In any case in view of the high price of the yield, nowadays, the application of such insecticides — even the least profitable one and with only one treatment, still brings in a remarkable nett profit to the farmer.

The results of the two-application test are recorded in Table XVII.

As far as kill percentage is concerned, John Powel wettable (XXI) showed the highest toxicity, while Agrocide wettable (XXVI) showed the lowest, followed by Neocide wettable (XX). Agrocide III Dust (XXVII) and Gesarol wettable (XIV) had equal kill percentage and are ranged as second in the descending order of the insecticides, in this respect. Gesarol Dust (XVI), Neocide wettable (XIX) and Geigy 33 liquid (XVI) had the same killing efficacy and are ranged third in this order followed by Agrocide wettable (XXIV), Geigy 33 liquid (XVIII) and Gesarol wettable (XV) which showed equal kill percentage. The higher concentrations exhibited slightly more toxicity than the lower ones, but the differences were insignificant.

TABLE XVII

NUMBER OF INSECTICIDE USED	KILL PERCENTAGE	TOTAL YIELD IN KILOS	INCREASE OF YIELD	
			KILOS	PERCENTAGE
(XIV).........	98.5	510.0	200.0	64
(XV).........	97.5	480.0	170.0	55
(XVI).........	98.1	520.0	210.0	68
(XVII)........	98.1	470.0	160.0	51
(XVIII).......	97.5	525.2	215.2	69
(XIX)........	98.1	500.0	190.0	61
(XX)..........	96.8	510.0	200.0	64
(XXI)........	99.5	465.2	155.2	50
(XXIV).......	97.3	575.2	265.2	87
(XXVI).......	94.0	530.0	220.0	71
(XXVII)......	98.5	600.0	290.0	93
Check	—	310.0	—	—

As regards the increase of yield gained by control, Agrocide III Dust (XXVII) brought in 93% more amount of yield in proportion to the yield of check plots, while Agrocide wettable with both high and low concentrations, i.e. (XXIV) and (XXVI), gave 87% and 71% more yield, respectively. Geigy 33 liquid (XVIII), Gesarol Dust (XVI), Neocide wettable (XX) and Gesarol wettable (XIV) brought in 69%, 68%, 64% and 64% more yield, successively, while Neocide wettable (XIX), Gesarol wettable (XV), Geigy 33 liquid (XVII) and John Powel wettable (XXI) gave 61%, 55%, 51% and 50% more yield, respectively. Agrocide wettable (XXIV) and Gesarol wettable (XIV), both at higher concentrations, gave an increase of yield more than that of their respective lower ones, i.e. (XXVI) and (XV). Geigy 33 liquid (XVIII) and Neocide wettable (XX) at smaller dosages each, on the contrary, gave an increase of yield more than that at larger ones, namely, (XVII) and (XIX), respectively. In that case the higher concentrations of these two last insecticides seem to have a bad effect on the yield.

The total cost of control, the value of increase of yield and the nett profit thus gained are recorded in Table XVIII.

TABLE XVIII

NUMBER OF INSECTICIDE USED	COST OF TREATMENT IN EGYPTIAN POUNDS	VALUE OF INCREASE OF YIELD IN EGYPTIAN POUNDS	NETT PROFIT	
			EGYPTIAN POUNDS	PERCENTAGE
(XIV)	3.520	64.000	60.480	67
(XV).	2.420	54.400	51.980	57
(XVI)	4.680	67.200	62.520	69
(XVII)........	3.570	51.200	47.630	53
(XVIII)	2.446	68.864	66.418	73
(XIX)	1.620	60.800	59.180	65
(XX).........	1.470	64.000	62.530	69
(XXI)	1.620	49.664	48.044	53
(XXIV)	3.720	84.864	81.144	89
(XXVI)	2 520	70.400	67.880	74
(XXVII)	2.080	92.800	90.720	100

With regard to nett profit, the descending order of the insecticides is recorded underneath.

Agrocide III Dust (XXVII); Agrocide wettable, 0.4% concentration (XXIV); Agrocide wettable, 0.2% concentration (XXVI); Geigy 33 liquid, 0.125% concentration (XVIII); Gesarol Dust (XVI); Neocide wettable, 0.05% concentration (XX); Gesarol wettable, 1.0% concentration (XIV); Neocide wettable, 0.1% concentration (XIX); Gesarol wettable, 0.5% concentration (XV); Geigy 33 liquid, 0.25% concentration (XVII); and John Powel wettable, 0.1% concentratoin (XXI).

Agrocide III Dust (XXVII) proved to produce the highest nett profit (100%), followed by Agrocide wettable (XXIV), 89%, while Agrocide wettable (XXVI) ranks third, 74%, in proportion to Agrocide III Dust (XXVII). The most profitable Agrocide III Dust (XXVII), brings in a nett profit which is nearly 44 times as much as its expenses of control, while John Powel wettable (XXI), being the least profitable insecticide, brings in about 30 times as much nett profit as the amount of cost of control. But taking the total nett profit into consideration the ratio of that of the former to that of the latter is 1.9 to 1. The difference between the expenses of control of Agrocide III Dust (XXVII) and those of John Powel wettable (XXI) is about Egyptian pounds 610, but this small sum brings in a difference between the nett profits of both insecticides of Egyptian pounds 42.672, i.e., nearly 70 times as much as the difference between the expenses of control of these two insecticides. Gesarol Dust (XVI) is the most expensive insecticide, while Neocide

wettable, (XX), is the least and both bring in nearly the same profit, despite the ratio of their expenses of control which is 3.2 to 1. Geigy 33 liquid (XVIII) and Gesarol wettable (XV), involve nearly the same expense of control and contain the same D.D.T. concentration, but the former yields 73% total nett profit and the latter 57%. Agrocide wettable (XXVI), Gesarol wettable (XIV) and Geigy 33 liquid (XVII) entail practically the same expenses, but they vary with regard to nett profit, being 89%, 67% and 53%, respectively. Neocide wettable (XIX) and John Powel wettable (XXI) entail the same expenses of control and have the same concentration of D.D.T. but they bring in different nett profits, namely, 65% and 53% respectively.

By comparing the results of the insecticides in the one-application test with those in the two-application, respectively, more yield was gained in favour of the two-applications by almost all insecticides, with the exception of Neocide wettable (XX) and John Powel wettable (XXI). It seems that these two insecticides have by double treatment a bad effect on the plant The differences between the increase of yield in the two application test and that in the one-application are given in kilogramms and in a descending order, as follows :

(XXVII) 104.8; (XXIV) 95.2; (XVI) 74.8; (XIX) 64.8; (XV) 60.0; (XIV) 54.8; (XXVI) 40.0; (XVIII) 20.0; and (XVII) 4.8.

Neocide wettable (XX) and John Powel wettable (XXI) each brought in less yield in the two-application test than in the one-application, making a difference of 15.2 and 50.0 kilos, respectively.

The differences between the nett profits in the two-application test and those in the one-application are given below in Egyptian pounds.

(XXVII) 32.496; (XXIV) 28.604; (XVI) 21.596; (XIX) 19.190; (XV) 17.990; (XIV) 15.776; (XXVI) 11.540; and (XVIII) 5.177.

These differences in the nett profit were in favour of the two applications. With Geigy 33 liquid (XVII), Neocide wettable (XX) and John Powel wettable (XXI) the differences in the nett profit were, on the contrary, in favour of the one application, as they showed a loss of Egyptian pounds 0.249, 5.599 and 16.810, respectively, as a result of using two applications.

As regards kill percentage, the figures in the two-application test were generally higher than those in the one-application.

In 1949, the follownig insecticides were used in the one as well as in the two-application test :

Gesarol wettable, 1.0% concentration (XIV); Gesarol wettable, 0.5% concentration (XV); Gesarol Dust (XVI); Geigy 33 liquid, 0.25% concentration (XVII); Geigy 33 liquid, 0.125% concentration (XVIII); Agrocide wettable, 0.3% concentration (XXV); Agrocide wettable, 0.2% concentration (XXVI); Agrocide III Dust (XXVII); E. 605 f., 0.2% concentration;

(XXXIII); E 605 f., 0.01% concentration (XXXIV); and E. 605 Dust (XXXV).

The results of the one-application test are given in Table XIX.

TABLE XIX

NUMBER OF INSECTICIDE USED	KILL PERCENTAGE	TOTAL YIELD IN KILOS	INCREASE OF YIELD	
			KILOS	PERCENTAGE
(XIV)........	97.32	345.12	90.96	36
(XV).........	97.32	308.88	54.72	22
(XVI)........	94.94	380 64	126.48	49
(XVII)	95.54	405.12	150.96	59
(XVIII)	97.32	372 00	117.84	46
(XXV).......	96.43	336 72	82.56	32
(XXVI)	96.43	326.72	72.56	29
(XXVII)......	98.21	396.64	142.48	56
(XXXIII).....	98.21	425.60	171.44	67
(XXXIV).....	97.32	369.00	115.20	45
(XXXV)......	98.21	462.72	208.56	82
Check	—	254.16	—	—

In the one-application test, E 605 Dust (XXXV) and Agrocide III Dust (XXVII) showed the same killing efficacy. Geigy 33 liquid (XVIII), E. 605 f. (XXXIV), Gesarol wettable (XIV) and Gesarol wettable (XV) gave the same kill percentage. Agrocide wettable (XXV) and (XXVI) were equal in their toxicity followed by Geigy 33 liquid (XVII) and lastly by Gesarol Dust (XVI). E 605 f. (XXXIII) at higher concentration gave more kill percentage than its lower one (XXXIV), while, on the contrary, Geigy 33 liquid (XVII) at higher concentration showed less toxicity than its lower one (XVII). Gesarol wettable (XIV) and Agrocide wettable (XXV) both at higher concentrations gave the same kill percentage as their respective ones at lower dosages, (XV) and (XXVI), successively. E 605 Dust (XXXV) gave the highest increase of yield (82%) in proportion to that of the check. All insecticides at higher concentrations gave more increase of yield than their counterparts at lower ones. Agrocide III Dust (XXVII) and Gesarol Dust (XVI) gave 49% and 46% increase of yield in proportion to that of the check, but in comparison to the increase of yield gained by E 605 Dust (XXXV), their ratio to the latter will be 60 : 56 : 100.

The total cost, the value of the increase in yield and the nett profit consequently gained are recorded in Table XX.

As far as nett profit gained by control is concerned, the descending order of the insecticides is given below.

E 605 Dust (XXXV) ; E 605 f., 0.02% concentration (XXXIII) ; Geigy 33 liquid, 0.25% concentration (XVII) ; Agrocide III Dust (XXVII) ; Gesarol Dust (XVI) ; Geigy 33 liquid, 0.125% concentration (XVIII) ; E 605 f., 0.01% concentration (XXXIV) ; Gesarol wettable, 1.0% concentration (XIV) ; Agrocide wettable, 0.3% concentration (XXV) ; Agrocide wettable, 0 2% concentration (XXVI) ; and Gesarol wettable, 0.5% concentration (XV).

TABLE XX

NUMBER OF INSECTICIDE USED	COST OF TREATMENT IN EGYPTIAN POUNDS	VALUE OF INCREASE OF YIELD IN EGYPTIAN POUNDS	NETT PROFIT	
			EGYPTIAN POUNDS	PERCENTAGE
(XIV)........	1.760	29.107	27.347	42
(XV).........	1.210	17.510	16.300	25
(XVI)........	2.340	40.474	38.134	59
(XVII)	1.785	48.307	46.522	72
(XVIII)	1.223	37.709	36.486	57
(XXV)	1.040	26.419	25.379	39
(XXVI)	1.260	23.219	21.959	34
(XXVII)	1.040	45.594	44.554	69
(XXXIII)	1.460	54.861	53.401	83
(XXXIV)	1.060	36.864	35.805	56
(XXXV)	2.340	66.739	64.399	100

E 605 Dust (XXXV) and Gesarol Dust (XVI), both are the most expensive insecticides, but the former brings in the highest nett profit (100%), while the latter brings in only 59%, although they entail the same expenses. Geigy 33 liquid (XVII) and Gesarol wettable (XIV) both are at the same concentration of D.D.T. and involve the same expenses, yet they bring in different nett profits, namely 72% and 42% respectively, in proportion to that of E 605 Dust (XXXV), being the highest in this respect. The higher concentrations of all insecticides brought in more nett profits than their lower ones. The least expensive insecticides are Agrocide III Dust (XXVII), E 605 f. (XXXIV) and Agrocide wettable (XXV), and although they cause nearly the same expenses, yet they brought in different nett profits, namely, 69%, 56% and 39%, respectively. E 605 Dust (XXXV) costs Egyptian pounds 0.880 more than E 605 f. (XXXIII) per feddan, but this difference in expenses brings in a nett profit of about eleven Egyptian pounds. Geigy 33 liquid (XVIII), Agrocide wattable (XXVI) and Gesarol wettable (XV) entail nearly the same expenses, but give different nett profits, namely, 57%, 35% and 25%,

respectively, in proportion to E 605 Dust (XXXV), being the highest profitable insecticide.

In the two-application test, the results are recorded in Table XXI.

TABLE XXI

NUMBER OF INSECTICIDE USED	KILL PERCENTAGE	TOTAL YIELD IN KILOS	INCREASE OF YIELD	
			KILOS	PERCENTAGE
(XIV)	94.64	363.280	109.120	43
(XV)	93.45	315.600	61.440	24
(XVI)	95.24	389.760	135.600	53
(XVII)	95.83	429 040	174.880	69
(XVIII)	94.64	391.360	137.200	54
(XXV)	94.64	325 940	98.780	39
(XXVI)	94.05	371.760	117.600	46
(XXVII)	91.07	415.600	161.440	64
(XXXIII)	92.26	448.200	194.040	76
(XXXIV)	92.26	389.200	135.040	53
(XXXV)	96.43	506.880	252.720	99
Check	—	254.160	—	—

E 605 Dust (XXXV) gave the highest kill percentage while Agrocide III Dust (XXVII) gave the lowest. Geigy 33 liquid (XVII), Gesarol wettable (XIV) and Agrocide wettable (XXV) all at higher concentrations showed slightly more kill percentage than their counter-parts at lower ones, namely (XVIII), (XV) and (XXVI), respectively. E 605 f. (XXXIII) and (XXXIV) both at higher and lower concentrations gave the same killing efficacy.

Taking the increase of yield gained by control into consideration, E 605 Dust (XXXV) brought in the greatest increase, i.e., 99%, in proportion to the yield of the check. Gesarol wettable (XV), on the contrary, brought in the smallest increase, i.e., 24%. E 605 f. (XXXIII), Geigy 33 liquid (XVII) and Gesarol wettable (XIV), all at higher dosages gave more increase of yield than their respective insecticides at lower ones, (XXXIV), (XVIII) and (XV). Agrocide wettable (XXVI), at lower concentration gave, on the contrary, more increase of yield than its counterpart at higher one. As far as insecticides in dust form are concerned, E 605 (XXXV) proved to be the best, followed by Agrocide III Dust (XXVII) and lastly by Gesarol Dust (XVI).

The total expenses of control, the price of the increase of yield and the nett profit thus available are shown in Table XXII.

As regards the nett profit gained by control, the descending order of the insecticides will be as follows :

E 605 Dust (XXXV) ; E 605 f., 0.02% concentration (XXXIII) ; Geigy 33 liquid, 0.25% concentration (XVII) ; Agrocide III Dust (XXVII) ; Geigy 33 liquid, 0.125% concentration (XVIII) ; E 605 f., 0.01% concentration (XXXIV) ; Gesarol Dust (XVI) ; Agrocide wettable, 0.2% concentration (XXVI) ; Gesarol wettable, 1.0% concentration (XIV) ; Agrocide wettable, 0.3% concentration (XXV) ; and Gesarol wettable, 0.5% concentration (XV).

TABLE XXII

NUMBER OF INSECTICIDE USED	COST OF TREATEMNT IN EGYPTIAN POUNDS	VALUE OF INCREASE OF YIELD IN EGYPTIAN POUNDS	NETT PROFIT	
			EGYPTIAN POUNDS	PERCENTAGE
(XIV)........	3.520	34.918	31.398	41
(XV)........	2.420	19.661	17.241	23
(XVI)........	4.680	43.392	38.712	51
(XVII)........	3.750	55.926	52.392	69
(XVIII)......	2.446	43.904	41.458	54
(XXV).......	2.080	31 610	29.530	40
(XXVI)......	2.520	37.632	35.112	46
(XXVII).....	2.080	51.661	49.581	65
(XXXIII)....	2.920	62.093	59.173	78
(XXXIV)....	2.120	43.213	41.093	53
(XXXV).....	4.680	80.870	76.190	100

E 605 Dust (XXXV) brought in the highest nett profit (100%), while Gesarol wettable (XV) brought in the lowest (23%) in proportion to that of the former. Gesarol wettable (XV), although it proved to be the least profitable insecticide, yet it brought in a nett profit, which is about 7 times as much as its expenses of control. E 605 Dust (XXXV) and Gesarol Dust (XVI) both involved the same expenses of control, but the former brought in double as much nett profit as the latter. Geigy 33 liquid (XVII) and Gesarol wettable (XIV), both at the same conccentration of D.D.T., entailed also the same expenses of control, but the former brought 1.7 times as much nett profit as the latter. Geigy 33 liquid (XVIII), Agrocide wettable (XXVI), and Gesarol wettable (XV), although they cost practically the same yet they brought in different nett profits, the ratio of which being 2.3 : 2 : 1. Agrocide III Dust (XXVII), E 605 f. (XXXIV) and Agrocide wettable (XXV) involved nearly the same control expenses and yet again they brought in different nett profits, namely, 65%, 53% and 40% in proportion to that of E 605 Dust (XXXV), being the most profitable insecticide (100%). E 605 f. (XXXIII) cost Egyptian pounds 0.500 more than Gesarol wettable (XV) but this difference in the expenses of control brought in a difference in the nett profits of both insecticides of about forty-two Egyptian pounds, i.e., 84 times the difference in the expenses of control of those two insecticides.

By comparing the results of the insecticides in the two-application test with their counter-parts in the one-application, more increase of yield was gained, in favour of the two applications by all insecticides. The differences in the increase of yield between the one- and two-application test are recorded underneath in kilos and in a descending order, as follows :

(XXXV) 44.16 ; (XXVI) 35.04 ; (XXV) 26.22 ; (XVII), 23.92 ; (XXXIII) 22.60 ; (XXXIV) 19.84 ; (XVIII) 19.36 ; (XXVII) 18.96 ; (XIV) 18.16 ; (XVI) 9.12 ; (XV) 6.72.

By deducting the nett profit gained by control in the one-application test from that gained in the two-application, the difference in favour of the two applications is recorded in Egyptian pounds and arranged in a descending order as follows :

(XXVI) 13.153 ; (XXXV) 11.791 ; (XVII) 5.870 ; (XXXIII) 5.772 ; (XXXIV) 5.289 ; (XXVII) 5.027 ; (XVIII) 4.972 ; (XXV) (4.151 ; (XIV) 4.051 ; (XV) 0.941 ; (XVI) 0.578.

Agrocide wettable (XXV) proved to bring in the highest difference in nett profit by using two applications, followed by E 605 Dust (XXXV). Geigy 33 liquid (XVII) and E 605 f. (XXXIII) both brought in practically the same difference in nett profit with two applications and ranges third in the group as regards the descending order of the insecticides in this respect. The difference in nett profit in the third group was nearly half as much as the nett profit in the preceding one. Gesarol Dust (XVI) showed the least degree of difference in nett profit between one and two applications, followed by Gesarol wettable (XV).

The fact that the killing efficacy of all insecticides in the two-application test was less than that in the one-application, in 1949, was due to the unfavourable climatic conditions of that year, as a result of a slight rain which fell shortly after the second application, causing a partial dilution of the insecticides and thus reducing the kill percentage.

From all the above mentioned new insecticides, only 7 were repeatedly tested in 1948 and 1949. Taking the average kill percentage of those insecticides during these two years, their descending order will be as follows :

(A) *One-application Test*

Agrocide III Dust (XXVII), kill percentage 94.5 ; Gesarol wettable, 1.0% concentration (XIV), kill percentage 90.56 ; Geigy 33 liquid, 0.25% concentration (XVII), kill percentage 88.92 ; Geigy 33 liquid, 0.125% concentration (XVIII), kill percentage 87.51 ; Gesarol Dust (XVI), kill percentage 87.32 ; Gesarol wettable, 0.5% concentration (XV), kill percentage 86.76 ; and Agrocide wettable, 0.2% concentration (XXVI), kill percentage 86.32

(B) *Two-application Test*

Geigy 33 liquid, 0.25% concentration (XVII), kill percentage 96.97; Gesarol Dust (XVI), kill percentage 96.97; Gesarol wettable, 1.0% concentration (XIV), kill percentage 96.57; Geigy 33 liquid, 0.125% concentration (XVIII), kill percentage 96.07; Gesarol wettable, 0.5% concentration (XV), kill percentage 95.48; Agrocide III Dust (XXVII), kill percentage 94.79; and Agrocide wettable, 0.2% concentration (XXVI), kill percentage 94.03:

The descending order of these insecticides in the one-application test is not the same as that in the two-application. The higher concentrations showed higher kill percentage than their respective lower ones in both the one and the two application tests. The killing efficacy of all insecticides was in the two-application test higher than that in the one-application, respectively. In each of the one- and the two-application tests, the difference in the kill percentage between those various insecticides was insignificant with the exception of Agrocide III Dust (XXVII) in the one-application test. From that point of view they can be considered as practically equal in their toxicity.

Taking the average nett profit gained by control in 1948 and 1949 into consideration, the descending order of those insecticides is given underneath in Egyptian pounds.

(A) *One-application Test*

Agrocide III Dust (XXVII), nett profit 51.389; Geigy 33 liquid, 0.125% concentration (XVIII), nett profit 48.864; Geigy 33 liquid, 0.25% concentration (XVII), nett profit 47.200; Gesarol Dust (XVI), nett profit 39.529; Agrocide wettable, 0.2% concentration (XXVI), nett profit 39.149; Gesarol wettable, 1.0% concentration (XIV), nett profit 36.026; and Gesarol wettable, 0.5% concentration (XV), nett profit 25.145.

(B) *Two-application Test*

Agrocide III Dust (XXVII), nett profit 70.150; Geigy 33 liquid, 0.125% concentration (XVIII), nett profit 53.938; Agrocide wettable, 0.2% concentration (XXVI), nett profit 51.496; Gesarol Dust (XVI), nett profit 50.616; Geigy 33 liquid, 0.25% concentration (XVII), nett profit 50.011; Gesarol wettable, 1.0% concentration (XIV), nett profit 45.939; and Gesarol wettable, 0.5% concentration (XV), nett profit 34.610.

The descending order of the insecticides as regards the average nett profit gained by control in 1948 and 1949, was in the one-application test the same as in the two-application with the exception of Geigy 33 liquid (XVII) and Agrocide wettable (XXVI) which exchanged their ranks in both parallel tests. Geigy 33 liquid at a lower concentration (XVIII) gave more average

nett profit than its counter-part at a higher one (XVII) in both the one and the two-application tests, while Gesarol wettable at a higher dosage (XIV), on the contrary, gave more average nett profit than its respective one with a lower dosage (XV) in both parallel tests. The average nett profits of the insecticides were generally higher in the two-application test than their counter-parts in the one application. The difference of the average nett profit between each two respective insecticides in the one-application test on one hand and in the two-application on the other hand, is arranged in a descending order in Egyptian pounds as follows :

Agrocide III Dust (XXVII), nett profit 18.761 ; Agrocide wettable, 0.2% concentration (XXVI), nett profit 12.347 ; Gesarol Dust (XVI), nett profit 11.087 ; Gesarol wettable, 1.0% concentration (XIV), nett profit 9.913 ; Gesarol wettable, 0.5% concentration (XV), nett profit 9.465 ; Geigy 33 liquid, 0.125% concentration (XVIII), nett profit 5.074 ; and Geigy 33 liquid, 0.25% concentration (XVII), nett profit 2.811.

By using two applications, Agrocide III Dust (XXVII) was the most profitable of all insecticides, followed by Agrocide wettable (XXVI), while Geigy 33 liquid at higher concentration (XVII) was the least profitable. Geigy 33 liquid at the lower dosage (XVIII) was again more profitable than its counter-part at the higher one (XVII), while Gesarol wettable at both higher and lower concentrations, (XIV) and (XV), were practically the same in this respect.

(B) Field tests on set-onion

The insecticidal field tests against *Thrips tabaci* attacking set-onion were carried out at Schandawil in 1948 and 1949. Those insecticides which were repeatedly tested in both years in the one- and two-application parallel tests are recorded below.

Gesarol wettable, 1.0% concentration (XIV) ; Gesarol wettable, 0.5% concentration (XV) ; Gesarol Dust (XVI) ; Geigy 33 liquid, 0.25% concentration (XVII) ; Geigy 33 liquid, 0.125% concentration (XVIII) ; Agrocide wettable, 0.2% concentration (XXVI) ; and Agrocide III Dust (XXVII).

Moreover, there were other insecticides which were tested once, some in 1948 and some in 1949. Those tried once in 1948 are given underneath :

Neocide wettable, 0.1% concenration (XIX) ; Neocide wettable, 0.05% concentration (XX) ; John Powel wettable, 0.1% concentration (XXI) ; and Agrocide wettable, 0.4 % concentration (XXIV).

Those insecticides tried once in 1949 are indicated as follows :

Agrocide wettable, 0.3% concentration (XXV) ; E 605 f., 0.02% concentration (XXXIII) ; E 605 f., 0.01% concentration (XXXIV) ; and 605 Dust (XXXV).

As has already been mentioned in the previous paragraphs, the intensity of population of thrips was greater in 1948 than in 1949, due to the climatic conditions which were not suitable for the emergence and development of thrips in February 1949. The results concerning kill percentage are recorded in Table XXIII.

TABLE XXIII

(A) *One-application Test*

NUMBER OF INSECTICIDE USED	YEAR 1948	YEAR 1949	AVERAGE
(XIV)	82.1	97.3	89.7
(XV)	78.3	94.5	86.4
(XVI)	95.6	91.7	93.7
(XVII)	93.0	100.0	97.0
(XVIII)	89.0	94.5	91.8
(XIX)	92.2	—	—
(XX)	92.7	—	—
(XXI)	90.6	—	—
(XXIV)	83.4	—	—
(XXV)	—	97.3	—
(XXVI)	74.1	94.5	84.3
(XXVII)	97.0	94.5	95.8
(XXXIII)	—	97.3	—
(XXXIV)	—	86.2	—
(XXXV)	—	94.5	—

With regard to kill percentage in the one-application test, the descending order of the insecticides was not the same in 1948 as in 1949 due to changing of climatic conditions and varying intensity of population in these two years. Taking the average kill percentage of both years, the descending order of the insecticides is as follows :

Geigy 33 liquid, 0.25% concentration (XVII) ; Agrocide III Dust (XXVII) ; Gesarol Dust (XVI) ; Geigy 33 liquid, 0.125% concentration (XVIII) ; Gesarol wettable ; 1.0% concentration (XIV) ; Gesarol wettable, 0.5% concentration (XV) ; and Agrocide wettable, 0.2% concentration (XXVI).

The higher concentrations of the insecticides showed in both years higher killing efficiency than the lower ones, respectively. The toxicity of the insecticides in the one-application test was in 1949 higher than in 1948, with the exception of Gesarol Dust (XVI) and Agrocide III Dust (XXVII). The intensity of population in 1949 was remarkedly less than in 1948.

As far as kill percentage is concerned, the descending order of the insecticides in the two-application test was not the same in 1948 as in 1949

Taking the average kill percentage of both years, the descending order of the insecticides are given underneath.

(B) *Two-applicatoin Test*

TABLE XXIV

NUMBER OF INSECTICIDE USED	YEAR 1948	YEAR 1949	AVERAGE
(XIV)........	97.4	94.6	96.0
(XV).........	96.9	96.0	96.5
(XVI)........	98.0	93.3	95.7
(XVII).......	95.4	89.3	92.4
(XVIII)......	96.6	94.6	95.6
(XIX)........	96.9	—	—
(XX)........	95.0	—	—
(XXI).......	96.7	—	—
(XXIV)......	97.9	—	—
(XXV).......	—	94.6	–
(XXVI)......	97.1	92.0	94.6
(XXVII).....	99.3	94.6	97.0
(XXXIII)....	—	94.6	—
(XXXIV	—	93.3	—
(XXXV).....	—	92.0	—

Agrocide III Dust (XXVII); Gesarol wettable, 0.5% concentration (XV); Gessarol wettable, 1.0% concentration (XIV); Gesarol Dust (XVI); Geigy 33 liquid, 0.125% concentration (XVIII); Agrocide wettable, 0.2% concentration (XXVI); and Geigy 33 liquid, 0.25% concentration (XVII).

In the two-application test, the higher concentrations of the insecticides in comparison to the lower ones, showed different behaviour in toxicity in both years. In 1948, Gesarol wettable (XIV), Neocide wettable (XIX) and Agrocide wettable (XXIV), all with higher concentrations, secured slight higher killing efficiency than their counterparts with lower ones, (XV), (XX) and (XXVI), respectively, while Geigy 33 liquid, was contradictory in this respect. In 1949, Gesarol wettable (XIV) and Geigy 33 liquid (XVII), both with higher concentrations, showed less toxicity than their counterparts with lower ones, (XV) and (XVIII), respectively; while Agrocide wettable (XXV) and É 605 f. (XXXIII), both at larger dosage, gave, on the contrary, higher kill percentage than at lower ones, (XXVI) and (XXXIV), successively.

The toxicity of the insecticides in the two-application test was generally higher in 1948 than in 1949, respectively. Taking the average kill percentage of both years, the killing efficiency of the insecticides was in the two-application test higher than that of their counterparts in the one-application test,

with the exception of Geigy 33 liquid (XVII). By comparing the kill percentage of the insecticides yearly, those in the two-application test were higher than their respective ones in the one-application test in 1948, but in 1949 the result was different namely, Gesarol wettable (XIV), Geigy 33 liquid (XVII), Agrocide wettable (XXVI) and E 605 f. (XXXIII) all showed higher kill percentage in the one-application test than their respective ones in the two-application. Geigy 33 liquid (XVIII) and Agrocide III Dust (XXVII) recorded equal killing efficiency in both the one- and two-application tests.

As regards the yield, the results are given in Table XXV in kilos per feddan.

TABLE XXV

(A) *One-application Test*

NUMBER OF INSECTICIDE USED	YEAR 1948	PERCENTAGE	YEAR 1949	PERCENTAGE	AVERAGE	PERCENTAGE
(XIV).......	12192	191	15239	136	13716	157
(XV)........	8568	135	14717	131	11643	132
(XVI).......	12260	198	12523	112	12392	141
(XVII)......	12496	196	14475	129	13486	153
(XVIII).....	8096	127	14770	132	11433	130
(XIX).......	10648	167	—	—	—	—
(XX)........	8696	137	—	—	—	—
(XXI).......	8896	140	—	—	—	—
(XXIV)......	13560	212	—	—	—	—
(XXV)......		—	12850	115	—	—
(XXVI).....	10504	165	14165	126	12335	140
(XXVII)....	12424	195	12939	115	12682	144
(XXXIII)...	—	—	12320	110	—	—
(XXXIV)...	—	—	12[illegible]63	110	—	—
(XXXV)....	—	—	12778	114	—	—
Check.......	6368	1[illegible]0	11214	100	8791	100

According to the average yield of both 1948 and 1949, in the one-application test the descending order of the insecticides is recorded as follows :

Gesarol wettable, 1.0% concentration (XIV) ; Geigy 33 liquid, 0.25% concentration (XVII) ; Agrocide III Dust (XXVII) ; Gesarol Dust (XVI) ; Agrocide wettable, 0.2% concentration (XXVI) ; Gesarol wettable, 0.5% concentration (XV) ; and Geigy 33 liquid, 0.125% concentration (XVIII).

It could be noticed from the above mentioned descending order of insecticides that the higher concentrations brought in more yield than the lower ones, respectively. This fact was observed in 1948, but in 1949, the results in this respect were different. Geigy 33 liquid (XVII), Agrocide wettable (XXV) and E 605 f. (XXXIII) all with higher concentrations brought in less

yield than their counterparts with lower ones, (XVIII), (XXVI) and (XXXIV), respectively, while Gesarol wettable (XIV) at a larger dosage brought in more yield than its respective one (XV) at a smaller dosage.

In the one-application test, the yield gained by using a certain insecticide was in 1949 more than that of its counterpart in 1948.

TABLE XXVI

(B) *Two-application Test*

NUMBER OF INSECTICIDE USED	YEAR 1948	PERCENTAGE	YEAR 1949	PERCENTAGE	AVERAGE	PERCENTAGE
(XIV).......	12984	204	15954	142	14469	165
(XV)........	9904	156	15125	135	12515	142
(XVI).......	13088	206	16171	144	14630	166
(XVII).....	13648	214	16530	147	15089	172
(XVIII)....	8032	126	18802	168	13417	153
(XIX)......	11248	177	—	—	—	—
(XX)........	9312	146	—	—	—	—
(XXI)......	10480	165	—	—	—	—
(XXIV).....	13136	206	—	—	—	—
(XXV)......	—	—	16565	148	—	—
(XXVI).....	11240	177	15509	138	13375	152
(XXVII)....	13768	216	15168	135	14468	165
(XXXIII)..	—	—	16571	148	—	—
(XXXIV)...	—	—	14809	132	—	—
(XXXV)....	—	—	15815	141	—	—
Check.......	6368	100	11214	100	8791	100

With regard to the average yield of both 1948 and 1949 in the two-application test, the descending order of the insecticides is illustrated as follows :

Geigy 33 liquid, 0.25% concentration (XVII); Gesarol Dust (XVI); gesarol wettable, 1.0% concentration (XIV); Agrocide III Dust (XXVII); Geigy 33 liquid, 0.125% concentration (XVIII); Agrocide wettable, 0.2% concentration (XXVI); and Gesarol wettable, 0.5% concentration (XV).

According to this descending order, the higher concentrations brought in more yield than the lower ones, respectively. This fact was noticed in both 1948 and 1949 in almost all the insecticides with the exception of Geigy 33 liquid in 1949 in both the one- and the two-application tests. In the two-application tests, the yield of each insecticide and also that of the check was greater in 1949 than its counterpart in 1948.

By comparing the results of the insecticides in the two-application test with those in the one-application, and with regard to yield, those in the former

were greater than those in the latter in 1948 and 1949, respectively, with the exception of Geigy 33 liquid (XVIII) and Agrocide wettable (XXIV) in 1948, both insecticides being contradictory from this point of view.

As far as increase of yield gained by control is concerned the average results of both 1948 and 1949 are recorded in kilos per feddan in Table XXVII.

TABLE XXVII

(A) *One-application Test*

NUMBER OF INSECTICIDE USED	INCREASE OF YIELD	PERCENTAGE
(XIV	4925	56
(XV)	2852	32
(XVI)........	3601	41
(XVII)	4695	53
(XVIII)	2642	30
(XXVI)	3544	40
(XXVII)	3891	44

According to the figures concerning the increase of yield in the treated plots, the descending order of the insecticides in the one-application test is recorded underneath.

Gesarol wettable, 1.0% concentration (XIV); Geigy 33 liquid, 0.25% concentration (XVII); Agrocide III Dust (XXVII); Gesarol Dust (XVI); Agrocide wettable, 0.2% concentration (XXVI); Gesarol wettable, 0.5% concentration (XV); and Geigy 33 liquid, 0.125% concentration (XVIII).

The percentage given opposite to each insecticide indicates the proportion of the increase of yield gained by applicating that insecticide to the yield of the check (untreated plots). The higher concentrations in the one-application test brought in more increase of yield than the lower ones, respectively.

With regard to the previous figures concerning the increase of yield gained by control in the two-application test, the descending order of the insecticides is given below :

Geigy 33 liquid, 0.25% concentration (XVII); Gesarol Dust (XVI); Gesarol wettable, 1.0% concentration (XIV); Agrocide III Dust (XXVII); Geigy 33 liquid, 0.125% concentration (XVIII); Agrocide wettable, 0.2% concentration (XXVI); and Gesarol wettable, 0.5% concentration (XV).

As regards the average increase of yield of both 1948 and 1949, the descending order of the insecticides in the two-application test is not the same

as that in the one-application, due to the changing reaction of the plant to the different insecticides and their different concentrations.

TABLE XXVIII

(B) *Two-application Test*

NUMBER OF INSECTICIDE USED	INCREASE OF YIELD	PERCENTAGE
(XIV)........	5678	65
(XV)	3724	42
(XVI)........	5839	66
(XVII)	6298	72
(XVIII)	4626	53
(XXVI)	4584	52
(XXVII)	5677	65

By comparing the average results of increase of yield of both 1948 and 1949 in the two-application test with those in the one-application, those of the former were the greater. The difference of the increase of yield in favour of the two-application test are recorded in kilogramms per feddan in the following descending order : (XVI) 2238, (XVIII) 1984, (XXVII) 1786, (XVII) 1603, (XXVI) 1040, (XV) 872, and (XIV) 753.

By using two-applications the lower concentrations proved to bring in a greater amount in the increase of yield than the lower ones respectively. The higher dosages seemed to have a harmful effect on the plant, thus reducing the yield.

Concerning the expenses of control, the price of increase of yield and the nett profit thus gained, the average results of both 1948 and 1949 per feddan and in Egyptian pounds are given in Tables XXIX and XXX.

As far as the average nett profit of both 1948 and 1949 is concerned, the descending order of the insecticides in the one-application test is not the same as that in the two-application.

By comparing the average nett profits of both years in the one-application test with those in the two-application, there are differences in favour of two applications. These differences in the average nett profits are given in Egyptian pounds per feddan in a descending order as follows : (XVI) 20.040, (XVIII) 18.617, (XXVII) 16.820, (XVII) 14.245, (XXVI) 9.140, (XV) 7.510, and (XIV) 5.770.

Gesarol Dust (XVI) with two applications brought in an average nett profit of Egyptian pounds 20.040 more than the same insecticide with one-application, while Gesarol wettable (XV) brought in Egyptian pounds 7.510

and Gesarol wettable (XIV) Egyptian pounds 5.770. Agrocide III Dust (XXVII) made a difference in the average nett profit of Egyptian pounds 16.820 in favour of two applications, while Agrocide wettable (XXVI) made

TABLE XXIX

(A) *One-application Test*

NUMBER OF INSECTICIDE USED	COST	VALUE OF YIELD	NETT PROFIT	PERCENTAGE
(XIV)........	1.760	49.250	47.490	100
(XV)	1.210	28.520	27.310	58
(XVI)........	2.340	36.010	33.670	71
(XVII).......	1.785	46.950	45.165	95
(XVIII)......	1.223	26.420	25.197	53
(XXVI)......	1.260	35.440	34.180	72
(XXVII).....	1.040	38.910	37.870	80

only Egyptian pounds 9.140. Geigy 33 liquid (XVIII) with two applications brought in Egyptian pounds 18.617 average nett profit more than with one application, while Geigy 33 liquid (XVII) brought in Egyptian pounds 14.245.

TABLE XXX

(B) *Two-application Test*

NUMBER OF INSECTICIDE USED	COST	VALUE OF YIELD	NETT PROFIT	PERCENTAGE
(XIV)........	3.520	56.780	53.260	90
(XV)	2.420	37.240	34.820	59
(XVI)........	4.680	58.390	53.710	90
(XVII).......	3.570	62.980	59.410	100
(XVIII)......	2.446	46.260	43.814	74
(XXVI)......	2.520	45.840	43.320	73
(XXVII).....	2.080	56.770	54.690	92

With regard to those insecticides tested once either in 1948 or 1949, the results concerning increase of yield gained by control are recorded in kilogramms per feddan as follows :

(A) *One-application Test*

Year 1948 : (XIX) 4280, (XX) 2328, (XXI) 2528, (XXIV) 7192.
Year 1949 : (XXV) 1636, (XXXIII) 1106, (XXXIV) 1149, (XXXV) 1564.

(B) *Two-application Test*

Year 1948 : (XIX) 4880, (XX) 2944, (XXI) 4112, (XXIV) 6768.

Year 1949 : (XXV) 5351, (XXXIII) 5357, (XXXIV) 5357, (XXXV) 4601

The differences in the increase of yield in favour of two applications are given underneath.

Year 1948 : (XIX) 600, (XX) 616, (XXI) 1584.

Year 1949 : (XXV) 3715, (XXXIII) 4251, (XXXIV) 2473, (XXXV) 3037.

Agrocide wettable (XXIV) was the only insecticide by which the increase of yield was greater in the one-application test than in the two-application, the difference being 424 kilos per feddan.

As far as nett profit is concerned, the results of those insecticides are given below in Egyptian pounds per feddan.

(A) *One-application Test*

Year 1948 : (XIX) 42.650, (XX) 23.205, (XXI) 25.130, (XXIV) 71.845.

Year 1949 : (XXV) 15.460, (XXXIII) 10.260, (XXXIV) 10.820, (XXXV) 13.440.

(B) *Two-application Test*

Year 1948 : (XIX) 48.500, (XX) 29.290, (XXI) 40.820, (XXIV) 67.530.

Year 1949 : (XXV) 51.710, (XXXIII) 51.970, (XXXIV) 35.150, (XXXV) 41.610.

The differences in the nett profits in favour of two applications are indicated as follows :

Year 1948 : (XIX) 5.850, (XX) 6.085, (XXI) 15.690.

Year 1949 : (XXV) 36.250, (XXXIII) 41.710, (XXXIV) 24.330, (XXXV) 28.170.

Agrocide wettable (XXIV) with two-applications brought in Egyptian pounds 4.315 less nett profit than with one-application.

The descending order of the insecticides, with regard to either kill percentage or increase or yield is changing from year to year due to many factors, especially varying climatic conditions, intensity of population of thrips, degree of concentration and number of applications of the insecticides and the reaction of the different host plants and natural parasites to the various insecticides.

A LIST OF THE OLD AND NEW INSECTICIDES TESTED IN THE FIELD UNDER NATURAL CONDITIONS

(I) Paris green combination : (a) Paris green, 0.125% (by weight) ; (b)

freshly slaked lime, 0.375% ; (c) molasses, 2% ; (d) nicotine sulphate (black leaf 40), 0.1% ; (e) water (the rest).

(II) Orthodichlorbenzine combination : (a) orthodichlorbenzine, 0.30% ; (b) soft soap, 0.01% ; (c) jeyes fluid, 0.10% ; (d) water (the rest).

(III) Wood-tar solution : (a) wood-tar, 0.45% ; (b) caustic soda, 0.05% ; (c) water (the rest).

(IV) Volck emulsion, 1%.

(V) Nicotine sulphate solution : (a) nicotine sulphate (black leaf 40), 0.2% ; (b) soft soap, 1% ; (c) water (the rest).

(VI) Lime sulphur solution, 1.5% (constituents of stock solution to prepare 15 litres) : (a) sulphur, 4 kilos ; (b) quick lime, 2.5 kilos ; (d) water, 20 litres ; all materials to be boiled for 45 minutes.

(VII) Psylortox (D.D.T. preparation dissolved in miscible volatile solvent), used at 0.4% concentration = 0.1% D.D.T.

(VIII) Psylortox, the same as (VII), used at 0.2% concentration = 0.05% D.D.T.

(IX) P. 31 emulsion Psylortox (a combination of D.D.T. dissolved in oil emulsion with Psylortox), used at (a) 1.45% P. 31 emulsion = 1% oil + 0.05% D.D.T., and (b) 0.2% Psylortox = 0.05% D.D.T., i.e. : (a) + (b) = 1% oil + 0.1% D.D.T.

(X) P. 31 emulsion (D.D.T. preparation dissolved in oil emulsion), used at 1.45% concentration = 1% oil + 0.05% D.D.T.

(XI) P. 31 miscible oil Psylortox (a combination of D.D.T. dissolved in miscible oil with Psylortox), used at (a) 1.15% P. 31 miscible oil = 1% oil + 0.05% D.D.T., and (b) 0.2% Psylortox = 0.05% D.D.T., i.e. : (a) + (b) = 1% oil + 0.1% D.D.T.

(XII) P. 31 miscible oil (D.D.T. preparation dissolved in miscible oil), used at 1.15% concentration = 1% oil + 0.05% D.D.T.

(XIII) Pestox suspension (D.D.T. preparation), used at 0.365% concentration = 0.1% D.D.T.

(XIV) Gesarol wettable containing 5% D.D.T., used at 1% concentration = 0.05% D.D.T.

(XV) Gesarol wettable, as (XIV), used at 0.5% concentration = 0.025% D.D.T.

(XVI) Gesarol Dust, containing 5% D.D.T

(XVII) Geigy 33 liquid, containing 20% D.D.T., used at 0.25% concentration = 0.05% D.D.T.

(XVIII) Geigy 33 liquid, as (XVII), used at 0.125% concentration = 0.025% D.D.T.

(XIX) Neocide wettable, containing 50% D.D.T., used at 0.1% concentration = 0.05% D.D.T.

(XX) Neocide wettable, as (XIX), used at 0.05% concentration = 0.025% D.D.T.

(XXI) John Powel wettable, containing 50% D.D.T., used at 0.1% concentration = 0.05% D.D.T.

(XXII) John Powel wettable, as (XXI), used at 0.05% concentration = 0.025% D.D.T.

(XXIII) Agrocide III liquid (hexachlorbenzine, 666 preparation), used at 1.67% concentration = 0.05% Gamma.

(XXIV) Agrocide wettable, containing 50% 666 = 6.5% Gamma, used at 0.4% concentration = 0.026% Gamma.

(XXV) Agrocide wettable, as (XXIV), used at 0.3% concentration = 0.0195% Gamma.

(XXVI) Agrocide wettable, as (XXIV), used at 0.2% concentration = 0.013% Gamma.

(XXVII) Agrocide III Dust containing 5% 666 = 0.65% Gamma.

(XXVIII) Albolinum + 2% 666, used at 2% concentration = 2% mineral oil + 0.0052% Gamma.

(XXIX) Albolinum + 2% 666, used at 1% concentration = 1% mineral oil + 0.0026% Gamma.

(XXX) Vapotone, containing, 50% hexaethyltetraphosphate, used at 0.1% concentration.

(XXXI) E 605 f., containing 75% Diethyl-p. nitrophenyl-thiophosphate, used at 0.04% concentration.

(XXXII) E 605 f., as (XXXI) used at 0.3% concentration.

(XXXIII) E. 605 f., as (XXXI) used at 0.02% concentration.

(XXXIV) E 605 f., as (XXXI) used at 0.01% concentration.

(XXXV) E 605 Dust, containing 2% of active agent.

Nota Bene:

(A) The new insecticides (VII) to (XIII) are delivered from the Cambridge Pest Campaign, England; (XIV) to (XX) from Geigy, Basle, Switzerland; (XXI) and (XXII) from John Powel, New York, U.S.A.; (XXIII) to (XXIX) from the I.C.I., England; (XXX) from the California Chemical Corporation, U.S.A.; and (XXXI) to (XXXV) from Bayer, Leverkusen, Germany.

(B) The number of the old and new insecticides tested under field conditions reached 22. But, in consequence of the repetitions of most of the new insecticides, by using different concentrations, the number of tests thus carried out was raised to 35, as illustrated in the list.

A LIST OF THE AMOUNTS AND PRICES OF THE OLD AND NEW INSECTICIDES APPLIED PER FEDDAN AND ONE APPLICATION (1)

(I) (a) Paris green (0.125% concentration), 0.625 kilo, price 0.160; (b) slaked lime (0.375% concentration), 1.875 kilo, price 0.010; (c) molasses (2% concentration, 10 kilos, price 0.450; (d) nicotine sulphate (0.100% concentration, 0.500 kilo, price 0.580 = Total price : Egyptian pound 1.200.

(II) (a) Orthodichlorbenzine (0.300% concentration), 1.500 kilo, price 0.300; (b) soft soap (0.010% concentration), 0.050 kilo, price 0.005; (c) jeyes fluid (0.100% concentration), 0.500 kilo, price 0.075 = Total price : Egyptian pound 0.380.

(III) (a) Wood tar (0.450% concentration), 2.250 kilos, price 0.450; (b) caustic soda (0.050% concentration), 0.250 kilo, price 0.014 = Total price : Egyptian pound 0.464.

(IV) Volck (1% concentration), 5 kilos, price 0.325.

(V) (a) Nicotine sulphate (0.200% concentration), 1 kilo, price 1.160; (b) soft soap (1% concentration), 5 kilos, price 0.500 = Total price : Egyptian pound 1.660.

(VI) (a) Sulphur (1.5% concentration of stock solution), 2 kilos, price 0.070; (b) quick lime (1.5% concentration of stock solution), 1.250 kilo, price 0.010 = Total price : Egyptian pound 0.080.

(VII) Psylortox (0.400% concentration), 2 kilos, price ?

(VIII) Psylortox (0.200% concentration), 1 kilo, price ?

(IX) P. 31 emulsion Psylortox (1.450% P. 31 emulsion), 7.250 kilos, price ? P. 31 emulsion Psylortox (0.200% Psylortox), 1 kilo, price ?

(X) P. 31 emulsion (1.450% P. 31 emulsion), 7.200 kilos, price ?

(XI) P. 31 miscible oil Psylortox (1.150% P. 31 miscible), 5.750 kilos, price ? P. 31 miscible oil Psylortox (0.200% Psylortox), 1 kilo, price ?

(XII) P. 31 miscible oil (1.150% P. 31 miscible), 5.750 kilos, price ?

(XIII) Pestox (0.367% concentration), 1.835 kilo, price ?

(XIV) Gesarol wettable (1% concentration), 5 kilos, price 1.100.

(XV) Gesarol wettable (0.500% concentration), 2.500 kilos, price 0.550.

(XVI) Gesarol Dust (5% concentration), 10 kilos, price 2.200.

(XVII) Geigy 33 liquid (0.250% concentration), 1.250 kilo, price 1.125.

(XVIII) Geigy 33 liquid (0.125% concentration), 0.625 kilo, price 0.563.

(XIX) Neocide wettable (0.100% concentration), 0.500 kilo, price 0.150.

(XX) Neocide wettable (0.050% concentration), 0.250 kilo, price 0.075.

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(1) 500 litres diluted spray or 10 kilogramms Dust are needed for one application to cover an area of one egyptian feddan (4200 m^2).

(XXI) John Powel wettable (0.100% concentration), 0.500 kilo, price 0.150.

(XXII) John Powel wettable (0.050% concentration), 0.250 kilo, price 0.075.

(XXIII) Agrocide III liquid (1.670% concentration), 8.350 kilos, price ?

(XXIV) Agrocide wettable (0.400% concentration), 2 kilos, price 1.200.

(XXV) Agrocide wettable (0.300% concentration), 1.500 kilo, price 0.900.

(XXVI) Agrocide wettable (0.200% concentration), 1 kilo, price 0.600.

(XXVII) Agrocide Dust (5% concentration), 10 kilos, price 0.900.

(XXVIII) Albolinum + 2% 666 (2% concentration), 10 kilos, price 1.120.

(XXIX) Albolinum + 2% 666 (1% concentration), 5 kilos, price 0.560.

(XXX) Vapotone (0.100% concentration), 0.500 kilo, price 0.600.

(XXXI) E 605 f. (0.040% concentration), 0.200 kilo, price 1.600.

(XXXII) E 605 f. (0.030% concentration), 0.150 kilo, price 1.200.

(XXXIII) E 605 f. (0.020% concentration), 0.100 kilo, price 0.800.

(XXXIV) E 605 f. (0.010% concentration), 0.050 kilo, price 0.400.

(XXXV) E 605 Dust (2% concentration), 10 kilos, price 2.200.

Nota Bene : The wages of labourers and hire of machines necessary for one application per feddan are : Egyptian pound 0.660 for spray (five labourers and four spraying machines), and Egyptian pound 0.140 for dusting (one labourer and one dusting machine).

SUMMARY

Chapter I

Insecticidal Field Tests on Cotton Seedling

(1) Germination of cotton seeds needs a temperature of at least 12° C, while its optimum lies at 22° C. The lowest temperature for development of *Thrips tabaci* is 7-8° C. A relative humidity of not less than 70% is necessary for the development of thrips to continue.

(2) Thrips infestation in cotton cultivation generally begins when the young seedlings are 3.4 weeks old. When the ecological factors, especially climatic conditions are favourable for the germination and early growth of the seedlings, the tender leaves are sooner or later visited by thrips for the purpose of sucking and egg-laying as well. If the same favourable climatic conditions exist during incubation and hatching periods, the population of thrips increases enormously causing more or less damage according to the degree of its intensity. Application of insecticides is carried out mostly one

month after the date of sowing, of course only when the number of thrips per plant or hole shows the necessity of taking control measures. When climatic conditions are unfavourable, germination and early growth are either retarded, or cotton seeds are spoiled, and resowing is thus needed sometimes more than once. Infestation is also delayed or even weakened to such an extent, that in some years the season passes without any noticeable effect of thrips on the plant. The critical period of thrips attack to cotton seedlings at Sakha occurs normally from the middle of April to the middle of May and the infestation reaches its height nearly at the end of April, due to the fact that climatic conditions at that time are around the optimum for this insect.

(3) In 1947, climatic conditions were more favourable for the germination and early growth of cotton seedlings, as well as for incubation and hatching of thrips, than in 1946. The average number of holes in which seedlings grew was 94%, in 1947, against 87%, in 1946. The average percentage of damage of holes of seedlings by thrips was more in 1947 (21.6%) than in 1946 (12%), i.e., 1.8 : 1 times as much. In 1948 the climatic conditions were even worse than in 1946. Cotton growth and emergency of thrips were delayed about three weeks in comparison with the usual. The average number of holes of cotton seedlings was only 80% and the damage of cotton seedlings attributed to thrips was about 5%. The ratio of intensity of population of thrips in 1946, 1947 and 1948 is 2 : 3.7 : 1.

(4) By considering the average kill percentage of each insecticide for all three countings of thrips in 1946 and by regarding the difference in the killing efficiency between one and two applications, the value of one more treatment could be illustrated as follows :

(a) Pestox (XIII) secured more toxicity after two applications than after one, producing a difference in the killing efficiency of about 60% in proportion to the kill percentage after one application.

(b) Orthodichlorbenzine combination (II), Psylortox (VII) and Volck Emulsion (IV) gave with two applications, 36%, 36% and 31%, respectively, more kill than with one.

(c) Agrocide III liquid (XXIII) gained after two applications 25% more kill than after one.

(d) P. 31 Emulsion (X) gave with two applications 15% more kill than with one.

(e) Wood tar Caustic soda (III), P. 31 Miscible oil Psylortox (XI), Psylortox (VIII), P. 31 Miscible oil (XII) and Paris green combination (I) secured by two applications 9, 9, 6, 6 and 6%, respectively, more kill than by one application.

(f) P. 31 Emulsion Psylortox (IX) was the only insecticide by which the killing efficiency after two applications was less than that after one, by about 7% in proportion to kill percentage after one application.

Nota Bene : In the one-application test, P. 31 Emulsion with a higher concentration (IX) gave better killing efficiency than P. 31 Emulsion with a lover one (X), P. 31 Miscible oil Psylortox with a larger dose (XI). gave on the contrary less toxicity than P. 31 Miscible oil with a smaller dose (XII). In the two application test, P. 31 Emulsion (X) and also P. 31 Miscible oil (XII), both with the smaller concentration, gave a better killing efficiency than their respective ones with larger concentrations, (IX) and (XI), respectively. Psylortox, on the contrary, secured better results of kill percentage with a higher dosage (VII) than with a lower one (VIII). P. 31, either in emulsion (X) or in Miscible oil form (XII) had practically the same toxicity.

(5) By considering the average kill percentage of each insecticide for all three countings of thrips in 1947 and by regarding the difference in the killing efficacy between the one and two applications, the value of one more applications is explained below :

(a) Albolinum + 2% 666, 2% concentration (XXVIII) secured after two applications mroe kill percentage than after one, making a difference of 41.4% toxicity in proportion to that after one application.

(b) Geigy 33 liquid, 0.125% concentration (XVIII), gained with two applications 31.1% more kill than with one application.

(c) Agrocide wettable 0.4% concentration (XXIV), Albolinum with 2% 666, 1% concentration (XXIX), Gesarol wettable, 0.5% concentration (XV), Wood tar caustic soda (III) and Gesarol wettable 1% concentration (XIV) gained after two applications 27.6, 24.6, 24.2, 21.2 and 21.2% respectively, more kill than after one.

(d) Orthodichlorbenzine combination (II), Volck Emulsion (IV) and Agrocide wettable 0.2% concentration (XXVI) gave with two applications, 17.1, 16.5 and 16.2% more kill than with one application.

(e) Paris green combination (I) and Geigy 33 liquid, 0.25% concentration (XVII) secured after two applications, 9.9 and 6.5% more kill than after one application.

In the one application test, Geigy 33 liquid (XVII) and Gesarol wettable (XIV) both with higher concentrations gave better kill percentage than those with lower ones, (XVIII) and (XV), respectively, while Agrocide wettable (XXVI) and Albolinum with 2% 666 (XXIX) gave, on the contrary, higher killing efficiency with smaller dosages than with larger ones, (XXIV) and (XXVIII), respectively. In the two-application test, Gesarol wettable (XIV) and Geigy 33 liquid (XVII) both with higher concentrations gave better toxicity than those with lower ones, (XV) and (XVIII), respectively, while Agrocide wettable (XXVI) and Albolinum with 2% 666 (XXIX) gave, on the contrary a higher kill percentage with smaller doses than those with

larger doses, (XXIV) and (XXVIII), respectively. The old insecticides appeared at the bottom of the descending order of kill percentage of all tested insecticides.

(6) By considering the average kill percentage of each insecticide for all three countings of thrips in 1948, and by regarding the difference in the toxicity between the one and two applications, the value of one more treatment is explained as follows :

(a) Vapotone (XXX), Albolinum + 2% 666 (XXIX), Agrocide wettable (XXV) and Geigy 33 liquid (XVIII) secure more toxicity after two applications than after one, making a difference in the killing efficiency of 60, 54, 53 and 50%, respectively, in proportion to the kill percentage after one application.

(b) Gesarol Dust (XVI), Albolinum + 2% 666 (XXX) and Agrocide wettable (XXVI) gave by two applications 49, 48 and 43% more kill, respectively.

(c) John Powel wettable (XXII), Neocide wettable (XIX), Geigy 33 liquid (XVII), Gesarol wettable (XV) and Agrocide III Dust (XXVII) gave after two applications 40, 38, 37, 37 and 36% more kill, respectively.

(d) Gesarol wettable (XIV) gained after two applications 24% more kill than after one.

(e) John Powel (XXI), E 605 f. (XXXI) and (XXXIII) secured with two applications 10, 8 and 3%, respectively, more kill than with one application.

The greater the difference in the killing efficiency between one and two applications of a certain insecticide, the greater the value of a second application, from the economic point of view. In the one-application test, John Powel wettable (XXI), Gesarol wettable (XIV), Geigy 33 liquid (XVII) and Albolinum + 2% 666 (XXVIII) all with higher doses gave better kill percentage than those with lower ones, (XXII), (XV), (XVIII) and (XXIX), respectively. E 605 f. (XXXIII) and Agrocide wettable (XXVI) with smaller dosages, gave, on the contrary, better killing efficiency than with larger ones, (XXXI) and (XXV), respectively. In the two application test, no difference in the killing efficiency was noticed between higher and lower concentrations of E 605 f. (XXXIII and XXXI); Albolinum + 2% 666 (XXVIII and XXIX) and John Powel wettable (XXI and XXII), Agrocide wettable (XXV) and Geigy 33 liquid (XVII), both with higher concentrations, gave better toxicity than with lower ones, (XXVI) and (XVIII), respectively, while Gesarol wettable (XIV) and (XV) were contradictory in this respect.

(7) According to the average kill percentage of all three countings of thrips on both 1946 and 1947, the descending order of the old insecticides, in the one-application test is as follows :

(a) Paris green combination (I); (b) Orthodichlorbenzine combination (II) : (c) Wood tar caustic soda (III); and (d) Volck Emulsion (IV).

In the two-appplication test, the descending order of these old insecticides is the same as that in the one-application test, with the exception that Orthodichlorbenzine combination (II) precedes Paris green combination (I)

(8) As regards quick toxic action, Orthodichlorbenzine combination (II) seemed to be the first amongst the old insecticides, while Paris green combination (1), Wood tar caustic soda (III) and Volck Emulsion (IV) followed successively, as could be noticed in the one- and two-application tests in 1946 and 1947.

(9) Taking residual lasting effect into consideration, Paris green combination (I) appeared to be the best in this respect, in the one-application test, followed by Wood tar caustic soda (III), Orthodichlorbenzine combination (II) and Volck Emulsion (IV), respectively. In the two-application test, Orthodichlorbenzine combination preceded all the other old insecticides which then followed successively in the range as in the one-application test.

(10) According to the average kill percentage of all three countings of thrips of 1946 and 1947, the toxicity of the old insecticides increased in the two-application test in proportion to that in the one-application by the following percentages :

(a) Orthodichlorbenzine combination (II), 23.3%; (b) Volck Emulsion (IV) and Wood ar caustic soda (III), 19.4 and 17.3% respectively; and (c) Paris green combination (I) 8.3%.

It seemed that the difference in the toxicity between one and two applications, in the case of unstable old contact insecticides (II), (III) and (IV), was proportionally greater than in the case of old ones of a more stable nature (I). After a three weeks interval, the old insecticides still showed a residual toxicity varying from 32 to 56% in the one-application test, and from 42 to 61% in the two-application test.

(11) Taking the average kill percentage of each insecticide for all three countings of thrips of both 1947 and 1948 as a measure for comparison, the descending order of toxicity of the new insecticides is as follows :

(A) *One-application Test*

(A) Geigy 33 liquid, 0.25% concentration (XVII).

(B) (a) Gesarol wettable, 1% concentration (XIV); (b) Agrocide wettable, 0.2% concentration (XXVI).

(C) (a) Gesarol wettable, 0.5% concentration (XV); (b) Agrocide wettable, 0.4% concentration (XXIV).

(D) Albolinum + 2% 666, 1% concentration (XXIX).

(E) Albolinum + 2% 666, 2% concentration (XXVIII).

(F) Geigy 33 liquid, 0.125% concentration (XVIII).

(B) *Two-application Test*

(A) (a) Agrocide wettable, 0.4% concentration (XXIV); (b) Agrocide wettable, 0.2% concentration (XXVI).

(B) (a) Albolinum + 2% 666, 1% concentration (XXIX); (b) Gesarol wettable, 1% concentration (XIV); (c) Albolinum + 2% 666, 2% concentration (XXVIII); (d) Gesarol wettable, 0.5% concentration (XV); and (e) Geigy 33 liquid, 0.25% concentration (XVII).

(C) Geigy 33 liquid, 0.125% concentration (XVIII).

The range of the new insecticides with regard to toxicity, is not the same in the one-application test as in the two-application test. In the one-application test, Geigy 33 liquid and Gesarol wettable showed more kill percentage at higher concentrations than at lower ones; while Agrocide wettable and Albolinum + 2% 666 secured on the contrary less toxicity at higher dosages than at lower ones. In the two-application test, no difference in the kill percentage between higher and lower concentrations was practically noticed, with the exception of Geigy 33 liquid. The difference in the killing efficiency of the insecticides, when compared wih one another in the same test was insignificant.

(12) As regards the average kill percentage of each insecticide for all three countings of thrips in 1947 and 1948, the killing efficiency of the new insecticides in the two-application test was comparatively more than that in the one-application test, respectively. The increase of toxicity in the two-application test in proportion to that of the one-application test is illustrated in percentages as follows :

(A) Albolinum + 2% 666, (XXVIII), 44.2%.

(B) Geigy 33 liquid (XVIII), Agrocide wettable (XXIV) and Albolinum + 2% 666 (XXIX), 38.2, 36.8, and 36%, respectively.

(C) Gesarol wettable (XV), Agrocide wettable (XXVI) and Gesarol wettable (XIV), 29, 25.6 and 22%, respectively.

(D) Geigy 33 liquid (XVII), 17.4%.

(13) Taking quick toxic action into consideration, and according to the average kill percentage of the first counting in 1947 and 1948, the descending order of the new insecticides, was not the same in the one- and the two-application tests, and yet the difference in the killing efficiency of these insecticides, when compared with one another in each of the two parallel tests, was insignificant, so that it could be said that the new insecticides were practically equal in quick toxic action.

(14) As far as the residual lasting effect is concerned and according to the average kill percentage of the third counting in 1947 and 1948, the new insecticides still showed, after three weeks interval, a residual toxicity ranging from 49 to 63% in the one-application, and from 69 to 81.6% in the

two-application test. The residual lasting effect of those new insecticides was higher than that of the old ones by an average difference of toxicity varying from 12 to 50% in the one-application test and from 33 to 66% in the two-application test in proportion to the average kill percentage of the old insecticides.

(15) The figures denoting kill percentage of the insecticides in the second and also third counting, when compared with those in the first, respectively, showed a gradual decrease in the toxicity of almost all insecticides in the one- and two-application tests. But with regard to the figures in the second counting when compared with those in the third, there was a different behaviour in this respect, namely, there was a gradual decrease in some cases and a gradual increase in others. This fluctuation in the killing efficiency in the second counting in its relation to the third one is attributed to various factors amongst which the following are worth mentioning :

(a) Disturbance of naturål equilibrium in the relation between insects and their natural enemies, occuring through interference of unfavourable factors, could in our tests, be responsible for the apparent decrease in the kill percentage of the insecticides. After treatment, a large number of parasites and predators were either directly or indirectly killed together with their insect hosts, thùs causing a rapid increase of the surviving and also of the newly emerged insects in the period after treatment, before their natural enemies could get the chance to develop. The second counting of thrips, being carried out ten days after treatment, exhibited an apparent decrease of killing efficiency through a rapid and an unexpected increase of population of thrips. In the ten days interval following the second counting, the disturbance of natural equilibrium was again balanced, and the insecticidal residue appeared to have regained its toxicity as has already been noticed in the third counting.

(b) Climatic conditions were also one of the causes of the decrease in the kill percentage of the insecticides. When rain fell after treatment, the figures indicating killing efficiency, showed a decrease in the second counting, as a result of a partial wash off and a dilution of the insecticidal residue. Other factors causing a decrease in the toxicity of the insecticides were sun heat, air, light, etc., as they most probably caused a decomposition of the insecticides during a period of about three weeks after treatment.

(c) In the period following application of the insecticides, new growths of leaves, as well as newly grown patches in the leaves, were free from any trace of the insecticides, and therefore offered a safe field for the insects to feed on without getting injured, consequently reducing the killing efficiency of the insecticides.

(d) Higher concentrations of the insecticides increased their toxicity,

always providing that no harm was done to the plants through these higher doses

(e) Accumulation of the active elements through repetition of the application of the insecticides caused an increase of toxicity. Accumulation, at the same time, should by no means exceed a certain limit above which the plants might get injured.

(f) Penetration of the insecticides through the epidermis into the plant tissue, increased their toxicity against these sucking insects as long as these insecticides did not undergo a decomposition inside the plant tissue. The toxicity would increase even more, if after absorbtion, the insecticides came in contact with the cell sap, thus being widely circulated through the whole plant.

The fact that the difference of kill percentage between the figures in the second and those in the third counting was greater in 1948 than in 1947, was attributed to the unfavourable climatic conditions in 1948. In addition to the increase of population of thrips, during the first ten days interval after treatment, rain fell shortly before the second counting was carried out, consequently causing a dilution and also a partial wash-off of the insecticidal residue. These two factors working hand in hand reduced the kill percentage of the insecticides in the second counting in 1948 in comparison to that in 1947, during which no rain fell in that period. The unfavourable climatic effect on the insecticides was more noticeable in the one-application than in the two-application test, as a result of the accumulated insecticidal residue through double treatment, which proportionally compensated the loss through its reaction to the bad effect of the unfavourable weather conditions. In the ten days interval following the second counting, and during which rain did not fall, the insecticidal residue dried up, concentrated and partially regained its toxicity, as was noticed in the third counting in the two-application test in 1948. But in the one-application test in that year, rain fell in the second interval following the second counting, and a dilution and also a partial wash-off of the insecticidal residue occurred thus reducing the kill percentage in the third counting.

In 1947, in the two-application test, the figures of killing efficacy in the third counting showed a slight decrease of toxicity in comparison to those in the first and second countings. The differences in the kill percentage between the three countings were, however, insignificant, and the residue of almost all insecticides appeared to have a more lasting and a markedly higher toxicity in that normal year than in 1948. According to the author's observations and conclusions, climatic conditions played one of, if not the most, important factors affecting the toxicity of both the insecticides and their residue.

Chapter II

Insecticidal Field Tests on Onion

(1) In Egypt, onion is mostly cultivated as seed-onion or set-onion, the former for producing seeds and the latter for bulbs. The cultivation of onion from seed to seed takes about two years time. The control of thrips is usually carried out in February on set-onion and in March on seed-onion. These periods of carrying out control measures are confined to Shandawil Farm in Upper Egypt.

In seed-onion the ratio of the intensity of population of thrips in 1946, 1947, 1948, and 1949 is 4:18:4:1, respectively, while in set-onion the ratio in 1948 and 1949 is 8:1, successively. The intensity of population of thrips is varying every season of the year as well as from year to year according to the changing climatic conditions.

In this chapter the effect of the applied insecticides on onion crop will be studied, and thoroughly discussed especially as there is no interference of other insects attacking onion from the period following thrips infestation until harvesting the yield.

(A) *Field Tests on Seed-Onion*

(2) In 1946, and according to the figures showing kill percentage calculated 24 hours after second treatment, Paris green Combination (I) had the highest killing efficacy (84.7%), followed by Volck Emulsion (IV) (83.3%), Gesarol wettable (XIV) (82.5%), and Nicotine sulphate soap solution (V) (79.8%).

(3) As regards the increase of yield gained by control, Gesarol wettable (XIV) brought in the greatest amount = 161 kilos, i.e., 39% in proportion to the yield of the check (untreated plots) = 416 kilos. The percentages of the other insecticides are as follows : (I) 35%, (IV) 20%, and (V) 12%.

As regards the nett profit, Gesarol wettable (XIV) brought in Egyptian pounds 48.180, thus proved to be the best of those insecticides, and by setting 100% for its figure the percentages of those of the others in proportion to that of Gesarol wettable (XIV), are as follows : (I) 89%, (IV) 72%, (V) 45%.

(4) In 1947, the figures showing kill percentage varied from 45 to 77.5%. All insecticides at higher concentrations showed more killing efficacy than their counterparts at lower ones.

(5) With regard to the increase of yield gained by control Agrocide wettable (XXIV) brought in the greatest amount = 163.4 kilos, i.e. 743% in proportion to the yield of the check = 22 kilos. The percentages of the other insecticides in this respect are as follows : (XVII) 415%, (XXVI) 391%, (XIV) 325%, (I) 319%, (VI) 264%, (XVIII) 215%, (XV) 140%, and (V) 110%.

The climatic conditions in 1947 were most suitable for the emergence and increase of population of thrips, in comparison to the other years. The great loss of the yield in the check plots in 1947 was obviously due to the great intensity of population of thrips in that year. The yield in the treated plots was generally less than normal, due again to the same reason, although it was several times as much as the yield of the check.

As far as nett profit is concerned, Agrocide wettable (XXIV) brought in the highest sum = Egyptian pounds 48.748 (100%). The percentages of the other insecticides in this respect in proportion to Agrocide wettable (XXIV) are given as follows : (XVII) 53%, (XXVI) 51%, (XIV) 40%, (I) 40%, (VI) 35%, (XVIII) 26%, (XV) 15%; and (V) 6%.

(6) According to the average results of both 1946 and 1947, Gesarol wettable (XIV), although it showed less kill percentage (74.9%) than Paris green combination (I) (78.1%), yet it brought in Egyptian pounds 48.464 average nett profit which is 1.5 times as much average profit as the latter (Egyptian pounds 31.276). Nicotine sulphate soap solution (V) proved to have the least killing efficacy (63.3%) and brought in only Egyptian pounds 12.404 average nett profit, i.e. 25% in proportion to that of Gesarol wettable (XIV).

(7) In 1948, the figures showing kill percentage in the one-application test varied from 74.6 to 90.8%. The higher concentrations gave generally higher kill percentage than the lower ones, respectively.

(8) As regards the increase of yield gained by control, Neocide wettable (XX) gave the highest amount = 215.2 kilos, i.e., 69% in proportion to the yield of the check (310 kilos). The percentages of the other insecticides are indicated as follows : (XXI) 66%, (XVIII) 63%, (XXVII) 60%, (XXVI) 58%, (XXIV) 55%, (XVII) 50%, (XIV) 47%, (XVI) 43%, (XIX) 40%, and (XV) 35%.

John Powel wettable (XXI), Geigy 33 liquid (XVII), Gesarol wettable (XIV) and Neocide wettable (XIX), although they were applied at the same concentration of D.D.T., yet they brought in different increases of yield. This fact is most probably due to : (a) the method of manufacturing these different preparations : (b) the percentage of the para D.D.T., most active agent in each compound; and (c) the kind and quantity of the other active and inert ingredients.

Neocide wettable (XX), Geigy 33 liquid (XVIII) and Agrocide wettable (XXVI), all at lower concentrations, gave greater increase of yield than their counterparts at higher ones, namely XIX, XVII and XXIV, respectively. Gesarol wettable with a stronger dosage (XIV) was contradictory from this point of view.

As far as nett profit is concerned, Neocide wettable (XX) gave the

highest sum, Egyptian pounds 68.854 (100%). The percentages of the other insecticides in this respect, in proportion to Neocide wettable (XX), are mentioned as follows : (XXI) 95%, (XVIII) 89%, (XXVII) 85%, (XXVI) 81%, (XXIV) 76%, (XVII) 70%, (XIV) 65%, (XVI) 60%, (XIX) 57%, and (XV) 49%.

(9) In the two-application test, the figures denoting kill percentage varied from 94 to 99.5%. The higher concentrations exhibited slightly more toxicity than the lower ones, the differences were, however, insignificant.

(10) As regards the increase of yield gained by control, Agrocide III Dust (XXVII) brought in 290 kilos, that is 93% higher yield in proportion to the yield of the check 310 kilos. The percentages of the other insecticides in this respect are recorded as follows : (XXIV) 87%, (XXVI) 71%, (XVIII) 69%, (XVI) 68%, (XX) 64%, (XIV) 64%, (XIX) 61%, (XV) 55%, (XVII) 51%, and (XXI) 50%.

Agrocide wettable (XXIV) and Gesarol wettable (XIV), both at higher concentrations, gave greater increase of yield than their counterparts at lower ones, (XXVI) and (XV), respectively, while Geigy 33 liquid (XVIII) and Neocide wettable (XX), both at smaller dosages, gave on the contrary larger increase of yield than their respective ones at larger dosages, (XVII) and (XIX), respectively. In that case, the higher concentrations of these two last insecticides seemed to have a harmful effect on the yield.

As far as nett profit is concerned, Agrocide III Dust (XXVII) proved to produce the highest nett profit = Egyptian pounds 90.720, i.e. 100%. The percentages of the other insecticides in proportion to Agrocide III Dust (XXVII) are given as follows : (XXIV) 89%, (XXVI) 74%, (XVIII) 73%, (XX) 69%, (XVI) 69%, (XIV) 67%, (XIX) 65%, (XV) 57%, (XXI) 53%, and (XVII) 53%.

The difference between the expenses of control of Agrocide III Dust (XXVII) and those of John Powel wettable (XXI), is about Egyptian pounds 0.610, but this small sum brings in a difference between the nett profits of both insecticides of Egyptian pounds 42.672, i.e. nearly 70 times as much as the difference between the expenses of these two insecticides. Geigy 33 liquid (XVIII) and Gesarol wettable (XV) cost nearly the same and contain the same D.D.T. concentration, but they bring in different nett profits. Neocide wettable (XIX) and John Powel wettable (XXI) also entailed the same expenses and contained the same concentration of D.D.T. and yet they brought in different nett profits.

(11) By comparing the results of the insecticides in the one-application test with those in the two-application test, respectively, more yield was gained in favour of the two applications by almost all insecticides, with the excepttion of Neocide wettable (XX) and John Powel wettable (XXI).

It seems that these two insecticides have by double treatment a harmful effect on the plant. The differences between the increase of yield in the two-application test and that in the one-application are given in kilos per feddan in the following descending order : (XXVII) 104.8, (XXIV) 95.2, (XVI) 74.8, (XIX) 64.8, (XV) 60, (XIV) 54.8, (XXVI) 40, (XVIII) 20, and (XVII) 4.8.

Neocide wettable (XX) and John Powel wettable (XXI), each brought in less yield in the two application test than in the one-application test, making a difference of 15.2 and 50 kilos, respectively.

The differences between the nett profits in the two-application test and those in the one-application are given in Egyptian pounds in a descending order : (XXVII) 32.496, (XXIV) 28.604, (XVI) 21.596, (XIX) 19.190, (XV) 17.990, (XIV) 15.776, (XXVI) 11.540, (XVIII) 5.177.

These mentioned differences in the nett profit were in favour of the two applications. With Geigy 33 liquid (XVII), Neocide wettable (XX) and John Powel wettable (XXI), the differences in the nett profit were, on the contrary, in favour of the one-application, as they showed a loss of Egyptian pounds 0.249, 5.599 and 16.810, respectively, as a result of using two-applications.

The figures concerning kill percentage were generally higher in the two-application test than in the one-application.

(12) In 1949 the figures showing kill percentage in the one-application test varied from 94.94 to 98.21%. E 605 f. (XXXIII), at higher concentration, gave more kill percentage than its lower one (XXXIV), while, on the contrary, Geigy 33 liquid (XVII), at higher concentration, showed less toxicity than its lower one (XVIII). Gesarol wettable and Agrocide wettable, both at higher concentrations, gave the same kill percentage as their respective ones at lower dosages.

(13) With regard to increase of yield E 605 Dust (XXXV) gave the highest amount = 208.56 kilos, i.e., 82% in proportion to that of the check = 254 kilos. The percentages of the other insecticides in this respect are as follows : (XXXIII) 67%, (XVII) 59%, (XXVII) 56%, (XVI) 49%, (XVIII) 46%, (XXXIV) 45%, (XIV) 36%, (XXV) 32%, (XXVI) 29%, and (XV) 22%.

As far as nett profit in the one-application test is concerned, E 605 Dust (XXXV) brought in the largest sum = Egyptian pounds 64.399, i.e. 100%. The percentages of the other insecticides in this respect, in proportion to E 605 Dust (XXXV), are recorded as follows : (XXXIII) 83%, (XVII) 72%, (XXVII) 69%, (XVI) 59%, (XVIII) 57%, (XXXIV) 56%, (XIV) 42%, (XXV) 39%, (XXVI) 34%, and (XV) 25%.

The higher concentrations of all insecticides brought in more nett profit than their lower ones, respectively.

(14) As regards kill percentage of the insecticides in the two-application test in 1949, the figures varied from 91.07 to 96.43%. The higher concentrations showed slightly more kill percentage than the lower ones with the exception of E 605 f. (XXXIII) and (XXXIV) which showed equal kill percentage at both higher and lower concentrations.

(15) Taking the increase of yield gained by control into consideration, E 605 Dust (XXXV) brought in the greatest amount of increase = 252.720 kilos, i.e. 99% in proportion to the yield of the check = 254.160 kilos. The percentages of the other insecticides in this respect are indicated as follows : (XXXIII) 76%, (XVII) 69%, (XXVII) 64%, (XVIII) 54%, (XVI) 53%, (XXXIV) 53%, (XXVI) 46%, (XIV) 43%, ((XXV) 39%, and (XV) 24%.

E 605 f. (XXXIII), Geigy 33 liquid (XVII) and Gesarol wettable (XIV), all at higher dosages, gave more increase of yield than their counterparts at lower ones (XXXIV), (XVIII) and (XV); while Agrocide wettable (XXVI) at lower concentration, on the contrary, gave more increase of yield than its respective one at higher concentration.

As regards the nett profit gained by control in the two-application test in 1949, E 605 Dust (XXXV) brought in the largest sum = Egyptian pounds 76.190, i.e. 100%. The percentages of the other insecticides in this respect, in proportion to that of E 605 Dust (XXXV), are mentioned as follows : (XXXIII) 78%, (XVII) 69%, (XXVII) 65%, (XVIII) 54%, (XXXIV) 53%, (XVI) 51%, (XXVI) 46%, (XIV) 41%, (XXV) 40%, and (XV) 23%.

Geigy 33 liquid (XVII) and Gesarol wettable (XIV), both at the same concentration of D.D.T., entailed the same expenses of control, but the former brought in 1.7 times as much nett profit as the latter. E 605 f. (XXXIII) involved Egyptian pounds 0.500 more than Gesarol wettable (XV), but this difference in the expenses of control brought in a difference in the nett profits of both insecticides of Egyptian pounds 42, i.e. 84 times the difference in the expenses of control of those two insecticides.

(16) By comparing the results of the insecticides in the two-application test with their counterparts in the one-application, more increase of yield was gained in favour of the two-application by all insecticides. The differences in the increase of yield between the one- and two-application test are given in kilos per feddan in a descending order : (XXXV) 44.16, (XXVI) 35.04, (XXV) 26.22, (XVII) 23.92, (XXXIII) 22.60, (XXXIV) 19.84, (XVIII) 19.34, (XXVII) 18.96, (XIV) 18.16, (XVI) 9.12, and (XV) 6.72.

By deducting the nett profits gained by control in the one-application test from their counter parts in the two-application, the differences in favour of the two applications are recorded in Egyptian pounds and arranged in a descending order as follows : (XXVI) 13.153, (XXXV) 11.791, (XVII)

5.870, (XXXIII) 5.772, (XXXIV) 5.289, (XXVII) 5.027, (XVIII) 4.972, (XXV) 4.151, (XIV) 4.051, (XV) 0.971, and (XVI) 0.578.

(15) The fact that the killing efficacy of all insecticides was less in the two-application test than that in the one-application in 1949, was due to the unfavourable climatic conditions in that year, as a result of slight rain which fell shortly after the second application causing a partial dilution of the insecticides and thus reducing the kill percentage.

(B) *Field Tests on Set-Onion*

(1) With regard to kill percentage in the one-application test, the figures varied from 78.3 to 97% in 1948 and from 86.2 to 100% in 1949 The descending order of the insecticides in this respect was not the same in 1948 as in 1949. The higher concentrations showed in both years higher killing efficiency than the lower ones, respectively. The toxicity of the insecticides in the one-application test was in 1949 higher than in 1918, with the exception of Gesarol Dust (XVI) and Agrocide III Dust (XXVII). The intensity of population in 1949 was remarkedly less than in 1948.

In the two-application test, the figures denoting kill percentage varied from 95 to 99.3 in 1948, and from 89 to 96% in 1949. The descending order of the insecticides in the two-appplication test was also not the same in 1948 as in 1949. The higher concentrations showed in 1948 higher kill percentage than the lower ones, respectively, with the exception of Geigy 33 liquid. In 1949 the higher concentrations in case of Gesarol wettable and Geigy 33 liquid, were less in toxicity than the lower ones, while in case of Agrocide wettable and E 605 f., the greater dosages had larger kill percentage than the smaller ones, respectively. The toxicity of the insecticides in the two-application test, was generally higher in 1948 than in 1949.

By comparing the kill percentage of the insecticides, yearly, those in the two-application test were higher than their respective ones in the one-application test in 1948, but in 1949 the result was different. Gesarol wettable, Geigy 33 liquid, Agrocide wettable and E 605 f., all showed higher kill percentage in the one-application test than their counterparts in the two-application test, while Geigy 33 liquid and Agrocide III Dust recorded equal kill percentage in both parallel tests.

(2) As regards yield gained in the one-application test in 1948, Agrocide wettable (XXIV) gave the greatest amount, 13560 kilos, i.e. 213% in proportion to the yield of the check (untreated plots) (6368 kilos). The percentages of the other insecticides from this point of view are as follows : (XVI) 198%, (XVII) 196%, (XXVII) 195%, (XIV) 191%, (XIX) 167%, (XXVI) 165%, (XXI) 140%, (XX) 137%, (XV) 135%, and (XVIII) 127%.

In 1949, Gesarol wettable (XIV) yielded the largest amount = 15239 kilos, i.e. 136% in proportion to the yield of the check (11214 kilos). The percentages of the other insecticides in this respect are given as follows : (XVIII) 132%, (XV) 131%; (XXVI) 126%; (XXVII) 115%, (XXV) 115%, (XXXV) 114%, (XVI) 112%, (XVII) 111%, (XXXIV) 110%, and (XXXIII) 110%.

In the one-application test the descending order of the insecticides concerning yield, is not the same in 1948 as in 1949. The higher concentrations, in comparison to the lower ones, were acting differently in both years. In 1948, the higher dosages were the greater concerning yield, while in 1949 the smaller concentrations, on the contrary, yielded more than the larger ones, with the exception of Gesarol wettable. The amount of yield was in 1949 more than in 1948 in the treated and untreated plots as well, respectively.

In the two-application test in 1948, Agrocide III Dust (XXVII) gave the greatest amount of yield = 13768 kilos per feddan, i.e., 216% in proportion to the yield of the check (6368 kilos). The percentages of the other insecticides in this respect are given in a descending order as follows : (XVII) 214%, (XXIV) 206%, (XVI) 206%, (XIV) 204%, (XIX) 177%, (XXVI) 177%, (XXI) 165%, (XV) 156%, (XX) 146%, and (XVIII) 126%.

In 1949, Geigy 33 liquid (XVIII) gave the largest amount of yield = 18802 kilos per feddan, i.e. 168% in proportion to the yield of the check (11214 kilos). The percentages of the other insecticides from this point of view are as follows (in a descending order) : (XXXIII) 148%, (XXV) 148%, (XVII) 147%, (XVI) 144%, (XIV) 142%, (XXXV) 141%, (XXVI) 138%, (XXVII) 135%, (XV) 135%, and (XXXIV) 132%.

In the two-application test, the descending order of the insecticides concerning yield is not the same in 1948 as in 1949. The higher concentrations yielded greater amounts than the lower ones in both years, with the exception of Geigy 33 liquid in 1949. The amount of yield was comparatively greater in 1949 than in 1948 in the treated and untreated plots as well, respectively.

(3) As far as increase of yield gained by control is concerned, the descending order of the insecticides with their amounts of increase of yield in kilos per feddan are recorded as follows :

(A) *One-application Test*

Year 1948 : (XXIV) 7192, (XVI) 6272, (XVII) 6128, (XXVII) 6056, (XIV) 5824, (XIX) 4280, (XXVI) 4136, (XXI) 2528, (XX) 2328, (XV) 2200, and (XVIII) 1728.

Year 1949 : (XIV) 4025, (XVIII) 3556, (XV) 3503, (XXVI) 2951,

(XXVII) 1725, (XXV) 1636, (XXXV) 1564, (XVI) 1309, (XVII) 1261, (XXXIV) 1149, and (XXXIII) 1106.

(B) *Two-application Test*

Year 1948 : (XXVII) 7400, (XVII) 7280, (XXIV) 6768, (XVI) 6720, (XIV) 6616, (XIX) 4880, (XXVI) 4872, (XXI) 4112, (XV) 3536, (XX) 2944, and (XVIII) 1664.

Year 1949 : (XVIII) 7588, (XXXIII) 5357, (XXV) 5351, (XVII) 5316, (XVI) 4957, (XIV) 4720, (XXXV) 4601, (XXVI) 4295, (XXVII) 3954, (XV) 3911, and (XXXIV) 3595.

By comparing the results of the insecticides in the two-application test with those in the one-application test, and with regard to increase of yield, those in the former were greater than those in the latter in 1948 and 1949, respectively, with the exception of Geigy 33 liquid (XVIII) and Agrocide wettable (XXIV) in 1948. The difference in the increase of yield in favour of the two applications are indicated in kilogramms per feddan as follows (in a descending order) :

Year 1948 : (XXI) 1584, (XXVII) 1344, (XV) 1336, (XVII) 1152, (XIV) 792, (XXVI) 736, (XX) 616, (XIX) 600, and (XVI) 448.

Year 1949 : (XVIII) 4032, (XXXIII) 3751, (XXV) 3715, (XVI) 3648, (XXXV) 3037, (XXXIV) 2446, (XXVII) 2229, (XVII) 2055, (XXVI) 1344, (XIV) 715, and (XV) 408.

Geigy 33 liquid (XVIII) and Agrocide wettable (XXIV) yielded, with two applications in 1948, less than with one application, making 64 and 424 kilos, differences successively in favour of one application.

(4) With regard to the nett profit, the insecticides brought in the following sums in Egyptian pounds per feddan (in a descending order).

(A) *One-application Test*

Year 1948 : (XXIV) 70.220, (XVI) 60.520, (XVII) 60.155, (XXVII) 59.660, (XIV) 57.140, (XIX) 42.650, (XXVI) 40.760, (XXI) 25.130, (XX) 23.205, (XV) 21.450, and (XVIII) 16.717.

Year 1949 : (XIV) 39.150, (XVIII) 34.997, (XV) 34.480, (XXVI) 28.910, (XXVII) 16.350, (XXV) 15.460, (XXXV) 13.440, (XVII) 11.485, (XXXIV) 11.090, (XVI) 10.890, and (XXXIII) 10.260.

(B) *Two-application Test*

Year 1948 : (XXVII) 72.200. (XVII) 70.550, (XXIV) 65.280, (XVI) 64.800, (XIV) 63.960, (XIX) 48.500, (XXVI) 47.500, (XXI) 40.820, (XV) 34.260, (XX) 29.290, and (XVIII) 15.515.

Year 1949 : (XVIII) 74.755, (XXXIII) 51.970, (XXV) 51.710, (XVII) 50.910, (XVI) 47.170, (XIV) 45.000, (XXVI) 41.750, (XXXV) 41.610. (XV) 38.010, (XXVII) 37.740, and (XXXIV) 35.150.

By comparing the nett profits in the two-application with those in the one-application, there were differences in favour of the two applications, with the exception of Agrocide wettable (XXIV) in 1948. These differences are given below in Egyptian pounds per feddan (in a descending order) :

Year 1948 : (XXI) 15.690, (XV) 12.810, (XXVII) 12.540, (XVII) 10.395, (XVIII) 8.798, (XIV) 6.820, (XXVI) 6.760, (XX) 6.085, (XIX) 5.850, and (XVI) 4.280.

Year 1949 : (XXXIII) 41.710, (XVIII) 39.758, (XVII) 39.425, (XVI) 36.280, (XXV) 36.250, (XXXV) 28.170, (XXXIV) 24.060, (XXVII) 21.390, (XXVI) 12.840, (XIV) 5.850, and (XV) 3.530.

The differences in the nett profits of those insecticides tested repeatedly in 1948 and 1949 were greater in the former year than in the latter one, respectively, with the exception of Gesarol wettable at both concentrations.

(5) The descending order of the insecticides, with regard to kill percentage or increase of yield, was changing in consequence of so many varying factors, amongst which the following are worth mentioning : (a) climatic conditions, (b) intensity of population of thrips, (c) constituents degree of concentration and number of application of the insecticides applied, and (d) the reaction of the different host plants and natural parasites as well to the various insecticides.

A comparison of wet and dry bran baits

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In view of the difficulties met with in preparing wet bait in the desert, since 1943 experiments have been done from time to time in Egypt to find out under what conditions dry bait could be applied successfully. Neither water nor oil was used in the preparation of the mixture.

The main experiments were done in cages and were supplemented by a field trial.

The biggest cage covers an area of about 616 square metres (28×22 metres) with a height of 2.20 metres. The floor is divided into seven sandy beds, five of which, each two metres broad, run from west to east, the remaining two, each one meter broad, from south to north, with passages of about 1.50 metres wide in between. At the southern end of the cage, there are three sections partitioned off each $7 \times 7 \times 2.20$ metres in size.

In the beds, desert plants such as *Heliotropium undulatum*, *Panicum turgidum*, *Aerva tomentosa*, *Pennisetum dichotomum* and *Artemesia judaica*; and field crops such as maize, dukhn, or clover, are grown. In addition, a few *Lycium*, *Melia azedarach* and *Eucalyptus* trees grew separately in the enclosure.

Surface soil temperature, air temperature and air humidity were recorded at intervals of about three hours throughout the whole period of the experiments.

(A) Experiments in the Big Cage

(1) In August 1943, an experiment was done in the three partitioned sections already referred to, where maize was grown. Some 2500 adult *Euprepocnemis plorans* Charp. were offered dry bran or wet bran in each case mixed with 4% barium fluosilicate and broadcast in between the plants. There was no significant difference in the percentage of mortality, as is shown below :

NUMBER OF INSECTS	SPECIES AND STAGE	BAIT USED	PERCENTAGE OF MORTALITY AFTER				
			24 hours	48 hours	72 hours	96 hours	120 hours
1000	Adults *Euprepocnemis plorans* Charp.	Dry	3.6	16.0	32.2	36.4	47.1
1000		Wet	4.1	15.1	33.5	38.6	49.5
500		Control...	0	0	3.0	3.0	3.0

(2) From April to July 1950, experiments were made in the big cage. In April we had thousands of mature and immature *Schistocerca* adults produced from the spring generation together with hoppers from the summer generation. After that, adults of the summer generation and hoppers of various instars became available, and gradually, we had different stages of nymphal growth. The experiments were done with simple bran and the following technique was used :

(a) To make conditions as identical as possible, each kind of diet whether wet bran, dry bran, or green food was distributed in circles of equal area along the passages ; each occupied one third of the area. To avoid bias due to position, the northern-most food circle was not made with the same food in neighbouring passages and so on.

(b) The test foods were sometimes placed in the shade, sometimes in the sun and sometimes partly in each.

(c) To exclude any possible attractiveness that may be due to the brighter colour of the dry bran on attractiveness, artificially coloured bran was tested.

(d) In a second series of experiments, the foods were placed in squares of equal dimensions, and the different foods distributed alternately at equal distances from one another.

Results

(1) There were more aggregations of first and second instar hoppers on the green food, while older hoppers and adults preferred bran.

(2) In the ranges of temperature and humidity recorded below, the majority of adults and older hoppers fed on dry bran.

Air temperature in shade, 24-28° C ; relative humidity, 65-72% ; soil surface temperature, 28-35° C.

(3) With a further rise in temperature, as shown below, more individuals aggregated on wet bran.

Air temperature in shade, 28-33° C ; relative humidity, 62-71% ; soil surface temperature, 36-40° C.

(4) At still higher temperatures, both wet and dry bran were placed in the shade The insects just lingered from one food to the other showing no signs of preference. Temperature in sun and shade as recorded below.

Air temperature in shade, 31-37° C; relative humidity, 65-71%; soil surface temperature in the sun, 39-46° C.

The higher the soil surface temperature became, the more insects aggregated on wet bran. Even here they stood in rows in the shade of the iron rods holding the cage.

These observations strongly suggest that at higher temperatures the wet bran was preferred as a cool place to stand on, for as long as it remained wet it would be cooled by the evaporation of the moisture. There is no real indication that the wet bran was prefered as food, but it would naturally have more chance of being eaten by the locusts. It should be noted however, that thinly scattered wet bran would dry up in a few minutes in the sun at these temperatures and humidities.

(5) Artificial colours (red, green, and purple), were added to wheat bran and distributed evenly in adjacent patches. The insects showed no preference for any specific colour, and their reactions to coloured bran, wet or dry, at different temperatures was almost the same as in the case of uncoloured bran.

(B) An experiment under field conditions

When studying the behaviour of *Euprepocnemis plorans* Charp., it was noted that adults and advanced hoppers fed on dry leaves and stems of many plants that came in their way and that those living on bare land, after winter crops, were also found on many occasions feeding on dry plants They usually took shelter under heaps of hay, on which they also fed. Moreover, in maize fields, where the infestation was heavy, the cobs together with such tough weeds as *Alhagi maurorum*, were partially eaten. The farmers often complained that grasshoppers fed on maize seeds sown in the field.

In July 1950, an experiment was carried out in maize fields where plants were 20-30 cms high. About 60-70% of the insects were in the adult stage. The majority were found concentrated in the dense weeds surrounding the field, with a few scattered within.

Seven plots, of half an acre each, were chosen. Three plots were treated with dry bait, another three with the material wet, and one left in between as a control. The bran was mixed with 3% benzene hexachloride and broadcast thinly over the fields and in lines along the margins. After six hours, samples of the insects were collected from each plot and put in cages with green food.

Percentages of mortality were as follows :

TREATMENT	PERCENTAGE OF MORALITY AFTER		
	48 hours	72 hours	96 hours
Dry bait......	15	45	71
Wet bait	22	47	72
Control.......	0	2	5

The treated areas were examined two days later, and the numbers of dead insects calculated. The average number of dead insects per square meter were found to be about the same : 12 in the dry bait plots and 14 where wet bait had been applied.

The following points need a thorough investigation before dry baiting should be generally adopted :

(1) Under what condition, climatic or otherwise, would dry bait be used unsuccessfully and wet successfully? In particular the response of very young hoppers need investigation.

(2) What kinds and formulations of insecticide adhere satisfactorily to the bran when mixed and used dry ?

(3) How long wet baits and dry baits remain effective with various insecticides ?

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The life-history of the Greater Wax-Moth *(Galleria mellonella* L.*)* in Egypt, with special reference to the morphology of the mature larva

[Lepidoptera : Pyralidae]

(with 5 Plates, and 11 Tables)

by SALEM KAMEL EL-SAWAF

CONTENTS

INTRODUCTION

The life-history of the greater wax-moth, *Galleria mellonella* L., has been extensively studied by various workers in many parts of the world. Among those who contributed much to the biology of the insect are : Andrews (1921), Chase (1921), Paddock (1926, 1930), Borchert (1933-1935), Whitcomb Jr. (1936), and Bouhniol (1938).

With the exception of a very brief account given by Mellor (1938), no work has been done in Egypt.

Regarding the morphology of the mature larva, Fracker (1915) gave a setal map of the mesothorax. The distribution of the Malpighian vessels in the wall of the rectum has been studied by Ishimori (1924). In 1936, Hayes mentioned a few morphological points; the coxae of the first pair

of legs being scarcely or not separated from each other, and the crochets being of uniform length and circularly arranged except those of the claspers which were placed in a semicircle.

The above review shows clearly that practically no work has been done on *Galleria mellonella* in Egypt. It was, therefore, thought advisable, on account of the destructive nature of this pest, to work out its life-history. The external features of the different stages, and the morphology of the mature larva are also of special interest.

THE LIFE-HISTORY

(A) Material and breeding technique

The material was first secured in January 1947 from the insectary of the Department of Entomology of the Faculty of Agricultuure, Fouad I University, at Giza. An infested frame was taken and found to be containing larvae inside their cocoons. Some of these larvae were used for breeding the insect — as will be described later — inside milk-bottles and Petri-dishes placed in an empty hive simulating natural conditions; the rest of larvae were left on the frame and put in another hive, containing frames, for supplying the necessary material for dissection and also for such biological observations as the seat in which the eggs were laid and the cocoons spun.

The two abov-mentioned hives were placed in an open, shady place where breeding took place under most natural conditions. Ant invasion was prevented by coating the hive-stools with vaseline and immersing them in water dishes.

Previous workers on the biology of the insect used different rearing methods. Tchang (1933) placed couples in paper-boxes. Borchert (1933) reared the insect in glass bottles, but, as the moths did not lay eggs upon such a soft unhidden surface, he furnished suitable egg-laying devices. On a microscope slide, he fixed a piece of black paper, by means of wax or seccotine, so that the paper would be about one millimetre higher than the slide's surface. On introducing such a slide to the bottle, the female moths laid eggs between the slide and the paper.

Another device for egg-laying was used by Bouhniol (1938). This consisted in bands of black paper plicated into "accordeons" suspended in the middle of the bottle. In the course of his work, he improved the paper accordeons by doubling them with cellophane. He also readjusted Borchert's method by replacing the glass slides with thick cellophane, and pointed out that the cellophane slides should be longer than the diameter of the bottle's bottom in order to have the least contact with the latter. The eggs, fixed to their support, were put in 30 cc. bottles, and the newly-

hatched larvae were prevented from escaping by covering the bottles with metallic covers. Comb-wax was given as food to the larvae after hatching.

Comparing the breeding methods used by the above authors, it is apparent that the paper-boxes would not allow the watching of the insects, whereas the glass bottles permitted their observation. It may be noticed that although the glass slides of Borchert allow egg counting and examination under the binocular microscope, yet they are breakable and the eggs cannot be separated into groups as with the cellophane slides of Bouhniol which could be cut into pieces. However, in both the glass and cellophane slides, much time is required for their preparation. It may be noticed also that Bouhniol's metallic covers would not allow evaporation, and food introduction to the hatched larvae might entail their escape.

In the present work, half-litre milk-bottles were used. Bouhniol's accordeons of black paper were first tried but found unsatisfactory on account of the difficulty experienced in egg counting. These accordeons were then replaced by corrugated paper used for packing the glassware. The latter was cut into pieces, the length of which was slightly longer than the diameter of the bottle's bottom, and laid, with the corrugated side facing downwards, at one centimetre away from the bottom. The eggs were laid between the corrugations and were counted with a hand lens through the bottom of the glass bottle. The evasions of the young larvae were prevented by covering the bottles with muslin which also allowed evaporation.

Full-grown larvae were taken from the previously mentioned nucleus frame; each was isolated in a Petri-dish and left to pupate and gives rise to virgin adult. Each couple (male and female) was confined in a milk bottle provided with the corrugated paper and covered with cardboard in which aeration holes were made. Some females were left without males in order to assert if there were parthenogenetic reproduction. Daily examination for eggs was carried out, and adults which laid eggs were transferred to new bottles.

The bottles containing the eggs were supplied with food, and then covered with muslin. This food consisted of old brood-comb freed from wild larvae by being fumigated with carbon bisulphide for 24 hours after which the comb was aerated within a narrow-meshed wire cage before being introduced into the bottles. During periods of comb shortage, Haydak's mixture (1936) was successfully used. This mixture consists of corn flour, whole-wheat flour, skim-milk powder, dried powdered yeast, and bran, in the proportions of 4 : 2 : 2 : 1 : 2 respectively, added to a mixture of equal parts of glycerine and honey.

On hatching, the young larvae aimlessly wandered about the bottles for a short time after which they burried themselves in the wax-combs. The wax charged with larvae was then distributed on sub-culture milk-bottles,

containing food, where the larvae were left until they attained their full size.

Full-grown larvae, migrating from the wax, spun their cocoons beneath the muslin, which, at this stage, was replaced by a narrow-meshed wire-gauze. The larvae that came up to the wire-gauze, or to the sides of the bottles, to spin their cocoons, were taken and placed in Petri-dishes where they spun their cocoons leaving a somewhat transparent area through which one can observe pupation and determine its exact time.

On emergence, the adult moths were sorted out into their sexes.

The whole procedure was repeated for two seasons.

(B) Procedure followed in determining larval ecdyses

In order to determine the number of ecdyses, Chase (1921) allowed the eggs to remain in masses and the larvae were afterwards separated. One to six larvae were put in a thick glass slide with a deep hollow centre and closed with a cover slip held in place by a thin film of vaseline. After the first ecdysis, the larvae were separated. Marking the larvae, he discovered, was necessary to show the occurrence of moulting. This was done with a wood-alcohol solution of shellac, or a water solution of gum arabic, coloured with gentian violet, safranin, methyl green or another aniline dye. First-instar larvae were sprayed with a vaporizer, the rest of instars were marked by a bird's feather cut to a fine point. For nourishing the larvae, this author, used at first, bits of dry comb; but found that the larvae were concealed by boring into it; digging them out was often fatal. He finally discovered that the most successful method consisted in comb-wax chopped up, mixed with pollen, soft dead moths, and honey, and kneaded into a small loaf from which thin slices were cut and given to the young larvae. Half-grown larvae were fed on comb-wax.

Chase's method for housing the larvae keeps them in too confined an atmosphere. Better quarters were used by Borchert (1933) who utilised watch-glasses for the youngest larvae, Petri-dishes for the more aged ones, both glued peripherally to prevent evasions.

In the present work, eggs were obtained from accordeons of black paper which were cut into small pieces, each containing about five eggs, and put into embryological watch-glasses covered with glass covers held in place with a thin film of vaseline on the farthest horizontal corners only so that the larvae, on hatching, would not touch it. Thin slices of Chase's loaves were given before the hatching of larvae. After a couple of days from hatching, when the young larvae ceased wandering, each larva was transferred to a new watch-glass. The half-grown larva was put in a Petri-dish and fed on ordinary fresh comb-wax.

The larvae were not marked, but the watch glasses and Petri-dishes were carefully examined, twice daily, in search for, at least, the cast-skin of the head, which was an unmistakable sign for an ecdysis.

(C) The egg

Eggs were laid in concealed places inside the hive, as in the cracks between the super and the body, the body and bottom-board, or the super and cover. Egg-masses have also been observed in crevices of the hive's woodwork, or along the edges of the frames.

Similarly, it was found that in the breeding bottles, the females showed a marked preference to deposit their eggs on the egg-laying paper, or even under the bottle's cover, than on the comb itself.

This is in accordance with Milum and Geuther's findings (1935) who showed that the vast majority of eggs were laid in cracks and crevices along the closely-attached ends of comb-sections, and no eggs were found on the brood-comb except those laid in crevices where cocoons were pulled away from the waxen cell walls.

Abnormal places of oviposition were mentioned by other workers. Suire (1930) found the eggs on the comb itself and on reserves of honey and pollen, while Taylor (1934) claimed that the eggs were laid in any sheltered spot even outside the hive.

The eggs (Plate I, fig. 1) are laid upright, they are elliptical in form, with a more or less equal horizontal and vertical axes. The horizontal axis of the egg varied from 0.5 to 0.6 mm., while its vertical axis ranged from 0.4 to 0.5 mm. The chorion is externally sculptured with a cell-like structure arranged in concentric rings around the anterior end of the egg.

The eggs are pearly-white in colour with a shade of yellow.

Oviposition and number of eggs laid by a fertilised female

Tables I-IV show that, out of 25 fertilised females, 15 started to deposit eggs one day after emergence from the pupa, 9 did not begin oviposition until 2 days after emergence, whereas one began to lay eggs the third day of its emergence. In most cases, the fertilised females continued to lay eggs as long as their vitality lasted, while, in some cases, oviposition continued until death.

It may be seen from the same Tables (I-IV) that the total number of eggs laid by individuals of a batch of 25 fertilised females varied from 500 to 1813, with a mean of 1020.84 $\pm$ 213.89.

Incubation period

The incubation period of the fertilised eggs, as seen from Tables I-IV, is 17, 9, 9, and 10 days for the first, second, third, and fourth generations,

respectively; the average temperature in each case being 71.6, 87.1, 91.1, and 81.8° F., respectively.

TABLE I

The number of eggs laid daily by 10 fertilised females of the first generation starting 28.4.1948, and the incubation period of the eggs.
Average temperature 71.6° F.

DAY	NUMBER OF EGGS LAID BY FERTILISED FEMALE NUMBER:									
	1	2	3	4	5	6	7	8	9	10
First	—	—	—	–	—	475	—	581	501	—
Second	98	63	261	348	513	114	—	—	—	710
Third	271	351	—	90	—	260	434	—	364	—
Fourth	34	21	28	103	32	133	66	344	—	—
Fifth	48	34	73	49	—	57	94	125	134	146
Sixth	133	—	102	44	32	69	106	44	59	—
Seventh	80	28	23	15	–	—	80	27	66	69
Eighth	—	—	35	18	17	21	114	—	46	106
Ninth	94	—	21	41	—	—	41	—	—	—
Tenth	32	—	—	22	—	—	38	—	—	—
Eleventh	—	—	28	—	—	died	died	died	—	—
Twelveth	—	died	—	—	—	—	—	—	died	—
Thirteenth	died	—	29	—	—	—	—	—	—	—
Fourteenth	—	—	died	died	—	—	—	—	—	—
Fifteenth	—	—	—	—	died	—	—	—	—	died
Total number of eggs	790	500	597	730	594	1129	973	1121	1170	1031
Incubation period in days	17	17	17	17	17	17	17	17	17	17

Parthenogenetic eggs

It was observed that egg-laying was not conditioned by mating or fertilisation.

Table V shows that individuals of a batch of 10 unmated, separately confined females laid a total number of 182 to 462 eggs, with a mean of 302.9 ± 100.17. Oviposition began after 2, 3, 4, 5, 6, or 9 days after emergence from the pupal case.

Unlike fertilised eggs, parthenogenetic eggs were deposited singly or in small batches. They never hatched although subjected to the same conditions as fertilised eggs. The same conclusion was arrived at by Milum and Geuther (1935), and Vukasovic (1939).

(D) The larva

First generation larvae (Table VI) appeared in the middle of May 1948, and pupation occurred from late June until late in July. The duration

TABLE II

The number of eggs laid daily by 5 fertilised females of the second generation starting 7.7.1948, and the incubation period of the eggs.
Average temperature 87.1° F.

DAY	NUMBER OF EGGS LAID BY FERTILISED FEMALE NUMBER :				
	1	2	3	4	5
First........	862	776	624	51	401
Second......	—	—	214	—	–
Third	—	—		579	—
Fourth	151	125	—	—	489
Fifth........	136	124	21	52	96
Sixth	105	60	–	69	134
Seventh	57	died	117	57	133
Eighth......	died	–	7	49	49
Ninth	—	—	—	—	32
Tenth.	--	—	—	—	21
Eleventh	—	—	died	died	died
Total number of eggs.....	1311	1085	983	857	1355
Incubation period in days	9	9	9	9	9

TABLE III

The number of eggs laid daily by 5 fertilised females of the third generation starting 4.9.1948, and the incubation period of the eggs.
Average temperature 91.1° F.

DAY	NUMBER OF EGGS LAID BY FERTILISED FEMALE NUMBER :				
	1	2	3	4	5
First	451	374	622	–	—
Second......	138	122	398	502	410
Third	124	75	259	110	221
Fourth	72	88	184	117	112
Fifth........	135	49	120	49	98
Sixth	32	—	107	34	75
Seventh	7	37	65	35	38
Eighth	—	died	58	38	28
Ninth	—	—	died	24	—
Tenth	—	—	—	died	died
Eleventh	died	—	--	—	—
Total number of eggs.....	959	745	1813	909	982
Incubation period in days	9	9	9	9	9

of the larval period ranged from 42 to 70 days at an average temperature and humidity of 83.6° F. and 56 respectively.

Second generation larvae (Table VII) made their appearance in the middle of July 1948, and pupated from late August until late in September. The length of the larval period ranged from 37 to 68 days at an average temperature of 90.9° F. and an average humidity of 58.

Third generation larvae (Table VIII) appeared in the middle of September 1948, and pupation took place from late October until mid-November. The length of the larval period ranged from 37 to 68 days at an average temperature and humidity of 85.3° F. and 60 respectively.

Fourth generation larvae (Table IX) started in the middle of October 1947. Very few larvae pupated late in January 1948 and during February, the majority of larvae did not pupate until late in March or in April, while few pupated in May. The length of the larval period ranged from 98 to 225 days at an average temperature of 65.6° F. and an average humidity of 54.

Number of ecdyses and seasonal history of the larva

It is shown in Table X that, at an average temperature and humidity of 83.6° F. and 56 respectively, all the 20 larvae showed nine ecdyses.

The same Table shows also that the length of each of the nine periods of larval life ranged from 5-7, 4-6, 3-5, 3-4, 3-4, 3-5, 4-6, 4-6, and 7-10 days respectively, with an average of 5.5, 4.6, 4.1, 3.4, 3.15, 4.45, 4.85, 5.3, and

TABLE IV

The number of eggs laid daily by 5 fertilised females of the fourth generation starting 4.10.1947, and the incubation period of the eggs. Average temperature 81.8° F.

DAY	NUMBER OF EGGS LAID BY FERTILISED FEMALE NUMBER :				
	1	2	3	4	5
First	338	458	--	325	385
Second	532	310	402	171	154
Third	201	206	240	145	117
Fourth	273	115	104	62	112
Fifth	154	148	48	57	96
Sixth	94	81	39	31	53
Seventh	50	82	26	—	—
Eighth	83	57	died	died	died
Ninth	80	died	—	—	—
Tenth	died	—	—	—	—
Total number of eggs	1805	1455	859	791	917
Incubation period in days	11	11	11	11	11

8.2 days respectively. This shows that the present work's conclusions regarding the durations of the stadia are in complete agreement with those of Chase (1921); there is a gradual decrease in the length of each stadium from the first up to the sixth, then an increase begins until the last larval stage which, on account of the time taken in spinning the cocoon, becomes longer than any of the preceding stadia.

On hatching, the larvae measured about 2 mms. in length and 0.25 mm. in width. The body was whitish with a pale brown head.

Second stage larvae were much the same in colour as those of the first stage. They measured about 3 mms. in length and 0.3 mm. in width.

Third stage larvae grew darker. The somewhat greyish body had a head and tarsi more brown than before. The length of the body was about 5 mms., while its width was 0.5 mm.

Fourth stage larvae had the body, head, and tarsi darker than before. The characteristic hairs became visible on the body. The larva measured about 7 mms. in length and 0.75 mm. in width.

Fifth stage larvae grew darker, with the head and tarsi reddish-brown. The larva measured about 9 mms. in length and 1 mm. in width.

TABLE V

The number of eggs laid daily by 10 unmated females of the first generation starting 28.4.1948. Average temperature 71.6° F.

DAY	NUMBER OF EGGS LAID BY UNMATED FEMALE NUMBER :									
	1	2	3	4	5	6	7	8	9	10
First..........	—	—	—	—	—	—	—	—	—	—
Second........	—	—	10	—	-	—	—	—	—	—
Third	—	--	5	—	49	—	—	—	186	—
Fourth........	—	36	—	—	80	41	—	—	42	20
Fifth	229	45	71	—	—	8	—	—	88	156
Sixth	—	69	—	185	—	82	21	—	35	117
Seventh	—	33	6	—	22	104	197	—	22	81
Eighth	—	45	34	—	—	96	112	—	13	—
Ninth.........	16	—	—	—	—	32	42	141	—	—
Tenth.........	—	—	46	—	31	died	46	56	59	58
Eleventh	—	—	54	—	—	—	—	—	—	—
Twelveth	—	—	—	14	—	—	44	—	died	died
Thirteenth.....	40	died	died	—	—	—	died	died	—	—
Fourteenth.....	—	—	—	died	died	—	—	—	—	—
Fifteenth	died	—	—	—	—	—	—	—	—	—
Total number of eggs	285	228	226	199	182	363	462	197	445	432
The eggs never hatched										

Sixth stage larvae measured about 12 mms. in length and 1.25 mms. in width. The greyish body grew darker and a shield-like brownish area made its appearance on top of the prothorax.

Seventh stage larvae measured about 15 mms. in length and 1.5 mms. in width. The body, head, tarsi, and prothoracic shield grew darker in colour than before.

Eighth stage larvae became dirty grey in colour, with the head, tarsi, and the prothoracic shield almost brown. The length of the larva was about 20 mms., while its width was 2 mms.

TABLE VI

The progeny of 10 fertilised females of the first generation, the duration of larval and pupal stages, and the percentage of male to female moths. Hatching starting on 15.5.1948.

DATE OF PUPATION (1948)	LARVAL PERIOD IN DAYS	NUMBER OF LARVÆ	NUMBER OF MALES EMERGING IN :			NUMBER OF FEMALES EMERGING IN :		
			8 DAYS	9 DAYS	10 DAYS	9 DAYS	10 DAYS	11 DAYS
26 June	42	4	—	1	3	—	—	—
27 »	43	3	—	—	2	—	1	—
28 »	44	21	—	5	10	—	4	2
29 »	45	40	—	9	20	—	5	6
30 »	46	47	—	17	14	1	14	1
1 July	47	100	1	54	9	3	31	2
2 »	48	114	3	50	6	6	48	1
3 »	49	142	2	54	14	6	59	7
4 »	50	124	—	46	21	3	53	1
5 »	51	130	—	46	17	4	60	3
6 »	52	132	—	50	14	6	54	8
7 »	53	110	—	34	22	—	51	3
8 »	54	92	—	32	18	1	41	—
9 »	55	105	—	48	14	5	29	9
10 »	56	94	—	51	12	1	27	3
11 »	57	93	—	47	10	1	28	7
12 »	58	103	—	42	17	4	31	9
13 »	59	63	—	15	13	3	30	2
14 »	60	79	—	23	9	2	44	1
15 »	61	80	—	24	10	2	41	3
16 »	62	67	1	21	7	1	34	3
17 »	63	49	—	14	5	1	27	2
18 »	64	42	1	8	11	—	20	2
19 »	65	47	1	12	2	4	28	—
20 »	66	34	—	12	4	1	16	1
21 »	67	44	—	14	5	2	21	2
22 »	68	39	—	13	1	3	22	—
23 »	69	31	—	16	3	1	10	1
24 »	70	30	—	7	1	—	22	—
	TOTAL....	2057	9	763	294	61	851	79
Percentage of male to female moths = 51.8 : 48.2								

Ninth stage larvae (Plate I, fig. 2) measured about 25 mms. in length and 3 mms in width. The body became spindle-shaped, being broader in the middle, and almost rounded in cross-section. The larva spun a white, silken cocoon around itself, taking 2-3 days to complete it. At the beginning of the ninth stadium, the larva grew very dark, almost black in colour, and this condition continued for 3 or 4 days after which the larva became dirty grey as before, remaining so until pupation.

TABLE VII

The progeny of 5 fertilised females of the second generation, the duration of the larval and pupal stages, and the percentage of male to female moths. Hatching started on 17.7.1948.

DATE OF PUPATION (1948)	LARVAL PERIOD IN DAYS	NUMBER OF LARVÆ	NUMBER OF MALES EMERGING IN :			NUMBER OF FEMALES EMERGING IN :		
			8 DAYS	9 DAYS	10 DAYS	9 DAYS	10 DAYS	11 DAYS
23 August.......	37	6	3	3	—	—	—	—
24 »	38	17	13	4	—	—	—	—
25 »	39	24	10	7	—	7	—	—
26 »	40	34	19	5	—	10	—	—
27 »	41	23	10	8	—	5	—	—
28 »	42	48	23	14	—	10	1	—
29 »	43	73	35	20	—	15	3	—
30 »	44	84	25	25	—	28	6	—
31 »	45	80	13	35	—	27	5	—
1 September....	46	77	16	28	1	26	6	—
2 »	47	77	12	32	—	25	8	—
3 »	48	69	7	18	—	29	15	—
4 »	49	75	25	18	3	7	21	1
5 »	50	108	6	54	6	16	26	—
6 »	51	111	3	51	5	17	34	1
7 »	52	129	11	51	3	20	42	2
8 »	53	110	2	33	8	13	54	—
9 »	54	108	3	47	3	12	42	1
10 »	55	98	5	40	6	7	35	5
11 »	56	91	5	26	9	6	42	3
12 »	57	64	—	18	6	2	37	1
13 »	58	60	—	22	8	3	24	3
14 »	59	55	1	12	10	6	22	4
15 »	60	33	—	10	3	1	17	2
16 »	61	32	1	11	2	5	11	2
17 »	62	30	—	11	2	1	16	—
18 »	63	17	—	7	2	1	7	—
19 »	64	14	—	3	1	—	8	2
20 »	65	7	—	—	1	1	3	2
21 »	66	4	—	2	—	1	1	—
22 »	67	8	—	2	—	—	5	1
23 »	68	1	—	—	—	—	1	—
	TOTAL....	1767	248	611	77	301	501	29
Percentage of male to female moths = 52.9 : 47.1								

(E) The cocoon

Full-grown larvae migrated comparatively long distances inside the hive in search for suitable places for spinning their cocoons.

Usually spun outside the comb, the cocoons were occasionally found upon the comb or in the mass of webs and debris lying about.

The cocoons were mostly placed in slight depressions grooved by the pupating larvae in almost every part of the wood of the hive and frames. They measured about 2 cms. long, and were made of whitish, strong, dense silk harbouring bits of excreta (Plate I, fig. 3 A). At the front end, the cocoon had an operculum, consisting of 1, 2, or 3 v-shaped flaps fastened together with few silken threads (Plate I, fig. 3 B, C and D).

TABLE VIII

The progeny of 5 fertilised females of the third generation, the duration of the larval and pupal stages, and the percentage of male to female moths. Hatching started on 14.9.1948.

DATE OF PUPATION (1948)	LARVAL PERIOD IN DAYS	NUMBER OF LARVÆ	NUMBER OF ADULTS EMERGING IN THE FOLLOWING NUMBER OF DAYS:														
			9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
23.10- 1.11	39-48	837	16	375	370	76	—	—	—	—	—	—	—	—	—	—	—
2.11- 7.11	49-54	245	—	12	54	38	62	59	20	—	—	—	—	—	—	—	—
8.11-10.11	55-57	130	—	—	—	—	11	36	48	31	4	—	—	—	—	—	—
11.11-15.11	58-62	155	—	—	—	—	—	—	—	—	1	5	10	20	24	44	51
TOTAL.....		1367	16	387	424	114	73	95	68	31	5	5	10	20	24	44	51

DATE OF PUPATION (1948)	AVERAGE TEMPERATURE IN °F.	AVERAGE HUMIDITY	Percentage of male to female moths = 49.2 : 50.8
23.10- 1.11	80.8	60	
2.11- 7.11	77.2	60	
8.11-10.11	73.5	61	
11.11-15.11	70.2	63	

(F) The pupa

The yellowish, obtect pupa gradually grew darker until it became dark brown, with almost black regions around the wings, just before moth emergence.

The body of the pupa (Plate I, fig. 4 A, B and C) is distinctly divided into head, thorax and abdomen; that of the female is slightly larger than the male. The length of the female pupa ranged from 14 to 15 mms. in

TABLE IX

The progeny of 5 fertilised females of the fouth generation, the duration of the larval and pupal stages, and the percentage of male to female moths. Hatching started on 17.10.1947.

DATE OF PUPATION (1948)	LARVAL PERIOD IN DAYS	NUMBER OF LARVÆ	NUMBER OF ADULTS EMERGING IN THE FOLLOWING NUMBER OF DAYS :								
			12	13	14	15	16	17	18	19	20
23.1- 9.3..	98-144	178	—	—	—	—	—	—	—	—	—
19.3-31.3	151-166	117	—	—	—	—	—	—	—	—	—
1.4-16.4..	167-182	727	—	—	—	—	—	—	—	13	102
17.4-30.4..	183-196	161	—	—	—	—	—	1	7	41	62
1.5- 9 5..	197-205	44	—	—	—	—	3	16	10	15	—
11.5-16.5..	207-212	15	—	—	3	6	6	—	—	—	—
18.5-29.5..	214-225	18	4	8	6	—	—	—	—	—	—
TOTAL.....		1260	4	8	9	6	9	17	17	69	164

DATE OF PUPATION (1948)	NUMBER OF ADULTS EMERGING IN THE FOLLOWING NUMBER OF DAYS :														
	21	22	23	24	25	26	27	28	33	34	35	36	37	38	39
23.1- 9.3..	—	—	—	—	—	—	—	—	3	1	2	6	8	5	3
19.3-31.3	—	—	21	29	38	16	10	3	—	—	—	—	—	—	—
1.4-16.4..	209	221	107	55	20	—	—	—	—	—	—	—	—	—	—
17.4-30.4..	42	8	—	—	—	—	—	—	—	—	—	—	—	—	—
1.5- 9 5..	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
11.5-16.5..	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
18.5-29.5..	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
TOTAL.....	251	229	128	84	58	16	10	3	3	1	2	6	8	5	3

DATE OF PUPATION (1948)	NUMBER OF ADULTS EMERGING IN THE FOLLOWING NUMBER OF DAYS :										AVERAGE TEMPERATURE IN °F	AVERAGE HUMIDITY	
	40	41	42	43	44	45	46	47	48	49			Percentage of male to female moths = 51.7 : 48.3
23.1- 9.3..	6	10	16	21	21	20	28	15	9	4	63.5	51	
19.3-31.3	—	—	—	—	—	—	—	—	—	—	67.2	53	
1.4-16.4..	—	—	—	—	—	—	—	—	—	—	70	54	
17.4-30.4..	—	—		—	—	—	—	—	—	—	72.1	57	
1.5- 9 5..	—	—	—	—	—	—	—	—	—	—	74.3	57	
11.5-16.5..	—	—	—	—	—	—	—	—	—	—	76.5	60	
18.5-29.5..	—	—	—	—	—	—	—	—	—	—	79.1	58	
TOTAL.....	6	10	16	21	21	20	28	15	9	4			

20 specimens, while its width varied from 4 to 5 mms., with a mean of 14.7 mms. for the length and 4.35 mms. for the width; whereas the male pupae presented a range of 12 to 13.5 mms. in length and 3.5 to 4 mms. in width, with a mean of 12.7 and 3.8 mms. for the length and width respectively.

TABLE X

The number and duration of the larval stadia in the first generation. Hatching on 15.5.1948. Average temperature 83.6° F.

NUMBER OF LARVA	DURATION OF STADIA IN DAYS									TOTAL PERIOD
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	
1	6	4	4	3	3	4	5	6	10	45
2	5	5	4	4	3	5	5	5	8	44
3	5	4	4	3	3	4	4	5	10	42
4	6	5	5	4	4	5	5	5	7	46
5	7	5	4	3	3	4	5	5	8	44
6	6	5	4	3	3	4	6	6	7	44
7	5	4	3	3	3	5	5	6	8	42
8	6	4	4	4	3	5	6	5	7	44
9	6	6	5	4	3	4	4	4	7	43
10	5	5	4	3	3	5	6	6	7	44
11	5	4	4	3	3	4	5	5	9	42
12	5	4	4	4	3	3	4	5	10	42
13	5	4	4	3	3	5	4	6	8	42
14	6	5	5	3	3	4	4	5	8	43
15	6	4	4	4	4	4	5	6	8	45
16	5	4	4	3	3	5	5	5	9	43
17	5	5	5	3	3	5	5	6	7	44
18	6	5	4	4	4	5	4	5	9	46
19	5	5	4	4	3	4	5	5	9	44
20	5	5	3	3	3	5	5	5	8	42
Range ...	5-7	4-6	3-5	3-4	3-4	3-5	4-6	4-6	7-10	42-46
Average..	5.5	4.6	4.1	3.4	3.15	4.45	4.85	5.3	8.2	43.55

The dorsal part of the pupal head is the vertex. On the ventral side is found the frons and the clypeus. The labrum is distinct and marked off the clypeus by the clypeo-labral suture. The eyes are prominent on the latero-ventral parts of the head. The antennae are long and conspicuous. The mandibles are only represented by two small elevations, one on each side of the labrum. The maxillary palpi are wanting, and the labial palpi are visible.

The division of the thorax into its three constituent segments is only recognizable from the dorsal aspect of the pupa. Ventrally, the segments are concealed by the legs and wings. The anterior pair of wings almost entirely conceals the posterior pair, except for a narrow strip along the

TABLE XI

The range and the mean, in days, of the longevity of starved male and female moths of the four generations in captivity.

GENERATION	LONGEVITY OF MALE IN DAYS		LONGEVITY OF FEMALE IN DAYS		TEMPERATURE IN °F.	
	RANGE	MEAN	RANGE	MEAN	MALE	FEMALE
First	21-30	25.2	11-15	12.8	74.2	71.6
Second.......	21-26	22.8	7-11	9.6	87.6	87.1
Third	25-30	27.6	8-11	9.6	91.8	91.1
Fourth	26-29	27.2	8-10	8.6	78	81.8

margins of the latter. The female pupa has the apical margin of the anterior wings almost straight while the male pupa has those margins curved to the inside. On the ventrum, the parts which are visible of the first pair of legs are the coxae. part of the femora, the tibiae, and the tarsi. Of the second pair of legs, part of the coxae, the tibiae, and the tarsi are visible, while the rest of parts are concealed under the first pair of legs. A very small part of the coxae and the distal ends of the tarsi, are the only visible parts of the third pair of legs, the other parts being concealed under the wings and the second pair of legs. A single pair of spiracles is found between the pro- and mesothorax ; this pair cannot be seen except by dissection.

Ten abdominal segments are present in the pupa. In both sexes, the fifth, sixth and seventh segments are movable, while the other segments are fixed. The abdominal segments are all recognizable from the dorsal aspect, while, ventrally, the segments 1, 2, 3, and part of 4 are concealed by the thoracic appendages. There are 8 pairs of abdominal spiracles, one pair on each of the first eight segments ; the first pair is concealed by the wings, and the eighth pair is vestigial. The genital aperture in the male pupa is situated on the ninth sternum ; whereas in the female pupa there is a common aperture, for both the bursa copulatrix and the oviduct, situated on the eighth sternum. The anus is situated on the distal margin of the tenth sternum. The tenth somite of the abdomen is produced to form the cremaster which Imms (1946) considered to be the homologue of the sur-anal plate of the larva and defined it as an organ of attachment. The cremaster consists of a dorsal, dark, stout plate, the distal margin of which is slightly bilobed. On either side of the anus, is a dark, stout hook.

A prominent ridge extends along the mid-dorsal line of the pupa over the thorax towards the distal end of the abdomen. Along the crest of this ridge, the surface is broken up into knobs. This ridge is continuous up to the

beginning of the movable segments of the abdomen where it disappears in the membranous parts of the latter. On the back of the eighth segment (and not the ninth as mentioned by Hayes (1936)), the longitudinal ridge divides into two transverse ridges which Hayes considered to be a pupal distinction between the greater and the lesser wax moths (*Galleria mellonella* and *Achroia grisella*), the latter not having these transverse ridges. The back of the ninth segment has the longitudinal ridge not continuous with that of the eighth, and the knobs are lacking.

Duration of the pupal stage

Male moths of the first and second generations (Tables VI and VII) emerged from the pupae in 8-10 days, whereas female pupae of the same generations gave adults in 9-11 days; the modal perial being 9 days for the males and 10 days for the females. The average temperature and humidity was 86.9° F. and 57 respectively for the first generation, and 91.6° F. and 57 respectively for the second generation.

Pupae of the third generation (Table VIII) gave adults in a period ranging from 9 to 23 days according to temperature and humidity.

The pupal period of the fourth generation varied from 12 to 49 days according to temperature and humidity (Table IX).

Contrary to Chase's findings (1921), Tables VI and VII show that there is a marked relation between the length of the pupal life and the sex of the moth; the duration for the male pupae being one day less than that of the female ones in the first and second generations. The same relation was also observed in the third and fourth generations although it is not shown in Tables IX and X due only to lack of space.

(G) The adult

Moths of the first generation appeared from early July until early in August 1948, while those of the second generation emerged from late August until early in October 1948. Third generation adults appeared from early September until early in December 1948, whereas those of the fourth generation emerged from late February until early in June 1948.

Longevity of adult moths

It may be seen from Table XI that the longevity of the starved moths in captivity ranged from 21 to 30 days for the males and 8 to 15 days for the females.

Percentage of male to female moths

It may be seen from Tables VI to IX that out of 6451 adults, which are the progeny of 25 fertilised females, the percentage of the male moths ranged from 47.2 to 52.9, with a mean of 51.4%.

Tables VI and VII show that the male moths always emerged before the females. The same thing was observed in the third and fourth generation adults although it is not shown in Tables VIII and IX due only to lack of space.

Contrary to what Paddock (1921) beleived, and in accordance with Andrews' findings (1921), the moths emerged and mated during daytime as well as at night.

Duration of copulation

In 9 specimens out of 10, the duration of the act of copulation ranged from 3 to 5 1/3 hours, with a mean of 3 3/4 hours; and in one case only, the act did not last more than 25 minutes.

The female moth (Plate I, fig. 5) is slightly larger than the male (Plate I, fig. 6); the former measuring 18 mms. in length with a wing expanse of 31 mms., while the latter has a length of 15 mms. and a wing expanse of 25 mms. The forewings are greyish-brown mottled with black areas along the apical and anal margins; those of the female are darker than in the male. The hindwings are creamy-white with a pale-brown frame along the hind margin.

Sexes are easily distinguished by the character of the apical margin of the forewing which is slightly curved to the inside in the male, while it is almost straight in the female.

Female moths may also be distinguished by having the labial palpi protruding forewards and slightly upwards, thus giving a beak-like appearance to the front end of the head whereas the labial palpi of the male moths are short and inclined inwards.

(H) Number of generations

The insect has four overlapping generations a year in Egypt. The first generation began late in April and ended early in August 1948, while the second generation lasted from early in July until early in October 1948. The third generation stayed from early in September until early in December 1948. The fourth generation was much the longest for it lasted from early in October 1947 until about mid-June 1948.

(I) Nature of damage and economic importance

In Egypt, the greater wax moth is responsible for a considerable loss to the wax-combs, especially those in storage, and to bees themselves as well. The pest seems to be more destructive in the mud hives which are still kept by a good number, in fact the majority, of beekeepers in this country.

The combs, in heavy infestations, are reduced to a mass of webs and debris. In weak colonies, the larvae might stick neighbouring frames together and thus block the bee-way with a result that bees swarm away. The depressions made by the pupating larvae in the woodwork of the hive is another type of damage caused by the insect.

As to the quantity of wax consumed by the larvae resulting from the eggs of a fertilised female, Borchert (1933) concluded that it was 1/6 lb.

In the present work, the comb-wax consumption of the larval progeny of one fertilised female, in a batch of 5, was found to be 665, 565, 442, 652, and 500 grams respectively. A single larva, during its life-time, consumed 1.57, 1.44, 1.49, 1.57, and 1.36 grams respectively in each case, with a mean of 1.48 grams per larva.

THE MORPHOLOGY OF THE LAST-INSTAR LARVA

(A) Material and methods

Specimens for the study of the larval morphology were obtained from the previously mentioned stock-hive.

For the examination of the various systems, living larvae were killed, fixed in Carnoy for a few hours, and then dissected while still fresh. Staining the tissues with a weak solution of haematoxylin for a few minutes proved to be very useful. Washing the stain off with running water, the resulting light-bluish coat given to the tissues helped very much in differentiating the finer structures.

The other structural studies were carried out on preserved specimens. The living larvae were killed by being dropped into boiling water for a few minutes until they straightened out. They were then removed, dried very quickly by laying them upon blotting paper, and, while still hot, dropped in a preserving solution of 2 parts 50% alcohol and 1 part glycerine, in which solution the specimens were left until further use.

Sections of the gizzard were made by fixing the whole material in Bouin's fluid for at least 18 hours, and the sections were stained with Mallory's triple stain.

To ascertain the larval sex, it was necessary to cut sections in the gonads after fixing them in carnoy for a few minutes, washing with 70% alcohol and staining with acid fuchsin.

The preparation of the integument for examining the body setae was done by cutting the larva longitudinally into two similar halves which were boiled in potash; skin, free of all internal structures except the tracheal trunk, was left. The skin was then washed with water, and the tracheae removed. It was then stained with acid fuchsin, passed through alcohols

into oil of cloves, then spread carefully between two slides until it lost its springiness, and permanently mounted.

Permanent preparations were made of most of the systems and structures described in the present work.

All the drawings are camera lucida ones.

The body of the larva is divided into three main regions; the head, the thorax and the abdomen.

The head and its appendages

The external structure of the head

The brownish head is of the prognathous type. From a lateral or ventral aspect, the head is oval in outline; while from a dorsal view, it is almost spherical.

On the dorsal aspect of the head (Plate II, fig. 7), three sutures are conspicuous, an epistomal suture and two frontal sutures. The epistomal suture is arched posteriorly and is identified by the anterior tentorial pits lying in its course. The frontal sutures run external and lateral to the epistomal suture, and converge anteriorly toward the bases of the mandibles.

The clypeus is the triangular plate bound posteriorly and laterally by the epistomal suture. Anteriorly, the clypeus is separated from the labrum by a membranous area. That this triangular plate is the clypeus is ascertained, according to Snodgrass (1935), by the facts that the anterior tentorial pits lie on its lateral sutures and that the dorsal dilator muscles of the mouth cavity have their origins on its inner surface.

The frons is transformed into a Y-shaped structure by the downward growth of the clypeus into its anterior part. The stem of the Y is invaginated into the head below the base of the clypeus forming the frontal groove. The anterior arms of the frontal Y, the adfrontals, are the narrow strips between the epistomal and the frontal sutures. According to Snodgrass (1935), the fact that the labral muscles arise on the internal ridge given from the frontal groove proves that the Y-shaped structure is the true frons.

The large, lateral areas of the head, separated medially at the base by the frontal groove, are the parietals or epicranial plates. The latter are bound anteriorly and laterally by the frontal sutures. Posteriorly, the parietals are limited by the wide occipital foramen owing to the absence of the occipital sutures.

Most of the ventral aspect of the head (Plate II, fig. 8), is occupied by the maxillolabial-hypopharyngeal complex.

Because of the absence of the occipital sutures, the occipital and postgenal areas may be defined, according to Snodgrass (1935), only as that part of the ventral region of the head lateral to the maxillolabial complex

and extending between the occipital foramen and the posterior articulations of the mandibles.

The base of the maxillolabial complex is separated from the neck by two triangular sclerotic plates, the hypostomal areas, whose inner angles approach each other at the median line of the labium. Each hypostomal area is separated from the corresponding postgenal region by a suture, the hypostomal suture, which extends posteriorly to the root of the posterior tentorial arm.

Setae and punctures of the head

(Plate II, figs. 7 and 8)

The clypeus carries three pairs of setae and a pair of pores or punctures. On each adfrontal there are two setae and one puncture; while each parietal bears ten setae and four punctures. There are six setae and two punctures on each postgenal area.

A puncture, according to Mc Indoo (1915), is a minute circular spot resembling a hair socket from which the hair has been pulled out. He claimed that sections through the punctures proved them to be olfactory pores, and a microscopic examination of them revealed that their external anatomy is different from that of hair sockets. He pointed out that a puncture has a dark border around its wall. Inside the wall, the chitin is lighter in colour, and at the centre may be seen an aperture which appears as a transparent spot. This aperture is a minute opening passing through the thin chitin inside the wall. However, the chitin inside the wall of a pulled seta is lighter in colour than that inside the wall of a pore.

The ocelli

(Plate II, figs. 7 and 8)

On each side of the head there are four ocelli arranged in the form of a curve near the base of the corresponding antenna. The two dorso-lateral ocelli are larger than the other two ventro-lateral ones.

The tentorium and internal ridges of the head

(Plate II, fig. 9)

The tentorium is reduced to a pair of slender, chitinized, longitudinal bars, the anterior tentorial arms, and a pair of short posterior arms.

The anterior tentorial arms arise from the arms of the epistomal ridge near its anterior end. They run horizontally backwards through the head until they join the posterior tentorial arms near the rear margin of the head.

Each posterior tentorial arm arises from the inner end of the ventral postoccipital apodeme of its side as a short, slender, chitinized bar which

curves downwards to join the anterior tentorial arm by a short, slender, unchitinized bar. The two posterior tentorial arms are joined together, near their junction, with the anterior tentorial arms, by a delicate, unchitinized, transverse bar, the posterior tentorial bridge.

Owing to this reduction of the tentorium, strong internal ridges have developed in the head along certain areas :

The lateral margins of the clypeus are produced internally forming a V-shaped ridge, the epistomal ridge, from the anterior arms of which arise the anterior tentorial arms.

Along the anterior margin of the clypeus is another internal ridge running between the anterior articulations of the mandibles.

The frontal groove is produced internally into a strong ridge, the frontal ridge.

Running along the hypostomal suture is another internal ridge, the hypostomal ridge.

Another internal ridge, the subgenal ridge, runs along the antennal socket to the anterior articulation of the mandible on each side.

There is a ventrally-curved ridge, the post-occipital ridge, running along the rear margin of the head walls. This ridge gives rise on each side of the head to a dorsal and a ventral broad apodemes which are concealed by the neck membranes. The dorsal post-occipital apodemes are continuous with the dorsal head wall; while the larger ventral apodemes project from the post-genal and hypostomal parts of the post-occipital ridge on either side. From the inner edges of the ventral post-occipital apodemes arise the posterior arms of the tentorium.

The antennae

(Plate III, fig. 10 A and B)

The larval head bears two small antennae, each of which is attached by a conical membrane to the antennal socket situated just to the external side of the mandibular base of its side.

The antenna is composed of three segments. The basal segment is smaller than the cylindrical second segment. The latter bears a puncture and a trichoid sensilla on its body, and on its apex are found a very long seta and two basiconic sensillae. The third, or distal, antennal segment is very small and bears on its apex a basiconic sensilla and another styloconic one.

The mouth-parts

The mouth parts of the larva are adapted for biting and chewing. They are composed of the labrum, the two mandibles, the hypopharynx, the labium and the two maxillae. The maxillae, the labium and the hypopharynx are united together forming a large composite structure, the maxil-

lolabial-hypopharyngeal complex, which is situated ventrally on the head and is supported basally on the hypostomal plates of the postgenae (Plate II, fig. 8).

The labrum

(Plate III, fig. 11 A and B)

The unpaired sclerite, which is attached to the anterior margin of the clypeus by a membranous area, is the labrum, whose distal free margin is medially incised giving the organ a pronounced bilobed appearance. The dorsal chitinized wall of the labrum (Plate III, fig. 11 A) bears six pairs of ordinary setae, while its ventral membranous surface (Plate III, fig. 11 B) is provided with three pairs of elongate conical setae as well as numerous minute microtrichia and forms the epipharynx.

Near either end of the proximal margin of the labral ventral, or buccal, surface is observed a hing-like sclerotized piece, the torma, upon which the labral muscle is inserted.

The mandibles

(Plate III, fig. 12)

Each mandible is a solid stout piece possessing five pointed, teeth-like projections on its mesal edge. It bears two setae on its dorso-lateral aspect, and it articulates with the head by means of a ginglymus and a condyle. The former, which is the anterior articulation, is a concavity of the mandible into which fits a convex process from the ventral head wall just lateral to the clypeus. The posterior articulation, or the condyle, is a rounded head at the base of the mandible which fits into a socket at the distal end of the post-gena.

The mandible is worked by means of powerful adductor and abductor muscles arising on the dorsal wall of the head.

The maxillolabial-hypopharyngeal complex

(Plate II, fig. 8, and Plate III, fig. 13)

In this composite structure, two lateral lobes, the maxillae, are distinct from a median lobe which constitutes the labium and hypopharynx.

Each maxilla consists of a cardo, a stipes, a maxillary palp, and a maxillary lobe. The cardo is a small, triangular, heavily chitinized area at the base of the maxilla. The stipes is a large membranous area possessing an L-shaped chitinized part, and is provided with two setae on its ventral aspect. Along the inner margin of the stipes is the line of a strong ridge, the stipital ridge, upon which are inserted the stipital muscles. The three-segmented maxillary palp (Plate III, fig. 15) is carried on a palpifer which bears distally a seta on the ventral aspect. The basal segment of the maxillary palp is the largest and bears ventrally on its apex a single seta;

whereas the third, or apical, segment is a minute cone provided with minute sensory papillae on its distal end. The maxillary lobe lies inner to the terminal segment of the palp, and it consists of a basal segment carrying two small cylinders distally. The basal segment of the maxillary lobe is a dorsally-incomplete ring bearing three styloconic sensillae on its dorsal aspect (Plate III, fig. 15). Each of the two distal cylinders, which might correspond to the galea and lacinia, bears a minute conical sensilla at its tip.

The labium consists of the submentum, the mentum, the prementum, the spinneret, and the labial palpi. The mentum is relatively very large and bears setae on its ventral aspect. The submentum is divided into a pair of triangular, chitinized sclerites situated at the base of the mentum. The latter carries on its distal end a large, chitinized, free plate, the prementum. Distally, the prementum carries a median structure, the spinneret, which is raised on a semicircular sclerite, and bears the opening of the silk duct at its tip. Laterally at its base, the prementum is supported on, and articulated to, the distal extremities of the ridges; thus allowing a free movement of the entire spinning apparatus. On each side of the spinneret, the prementum carries a minute labial palp (Plate III, fig. 14) which is carried on a semicircular sclerite, the palpiger. The labial palp consists of a principal cylindrical joint bearing distally a basiconic sensilla and a minute apical joint ending with a trichoid sensilla.

On the oral surface of the labium, is a median structure, the hypopharynx (Plate II, fig. 8), which is provided with numerous minute microtrichia.

(C) The thorax and its appendages

The part caudad to the larval head is the thorax. The latter consists of three successive segments, each of which bears on its ventral surface a pair of true legs.

The thoracic legs

(Plate III, fig. 16 A to D)

Each thoracic leg consists of the usual six successive segments; the coxa, the trochanter, the femur, the tibia, the tarsus, and the pretarsus. The coxa is an oval-shaped area at the base of the leg and attached to the ventral body wall. The trochanter is a wedge-shaped sclerite between the coxa and the following segment of the leg, the femur. The latter is a large cylindrical segment distad to the trochanter. The tibia is the elongate, cone-shaped segment that follows the femur and bends slightly mesad. Following the tibia is the small, single-jointed, cone-shaped tarsus. The distal segment of the leg is the pretarsus which consists of a single, dark, hooked claw.

(D) The abdomen and its appendages

Following the thorax are ten segments which constitute the abdomen. The first and second abdominal segments bear no appendages, but each of the next four segments bears a pair of prolegs. No other segment of the abdomen bears these structures except the last which bears a pair, sometimes called the anal prolegs or the anal claspers.

The prolegs

(Plate III, figs. 17 and 18)

The proleg is a fleshy, conical projection that ends distally in a short retractile lobe, the planta. Proximally, the planta is provided with an incomplete sclerotic ring whose outer portion is wanting. This ring is absent from the planta of the anal prolegs. On the periphery of its distal surface, the planta carries the crochets. The latter are almost uni-ordinal, and are arranged, on the first four pairs of prolegs, in a uniserial circle with their recurved points turning outward and upward; but on the anal prolegs, the crochets curve mesally and upward, and are limited to a semi-circle on the outer margin of the planta.

(E) Chaetotaxy of the thorax and abdomen

In the present work, the writer only presents two maps (Plate IV, figs. 19 and 20) showing the arrangement of the setae over the thoracic and abdominal segments. A study of these setae will be given later on in a separate paper.

(F) The alimentary canal

The digestive canal (Plate IV, fig. 21) is the straight tube, of almost the same length of the body, that extends from mouth to anus and occupies most of the body cavity. It is divisible into three primary regions: the stomodaeum or fore-intestine, the mesenteron or mid-intestine, and the proctodaeum or hind-intestine. The first and the third sections of the tube are differentiated into several more or less distinct regions.

The stomodaeum

The fore-intestine is that part of the alimentary tube leading from the mouth and extending through the head and thorax to join the mid-intestine near the hind margin of the mesothorax. The part of the stomodaeum contained in the head lies above the posterior tentorial bridge, and it passes into the thorax through the occipital foramen.

The stomodaeum is differentiated into 4 successive regions; the pharynx, the oesophagus, the crop, and the proventriculus.

The pharynx is the dilated chamber into which opens the mouth. It lies inside the head anterior to the sub-œsophageal commissures. Behind the latter, the stomodaeum takes the form of a short narrow tube, the oesophagus, which extends to the middle of the prothorax. Then the oesophagus widens considerably to form the crop, which extends to the middle of the mesothorax.

Between the crop and the mid-intestine lies the proventriculus, or gizzard, which is almost as wide as the crop and extends to the hind margin of the mesothorax. The inside surface of the gizzard bears numerous longitudinal rows of inwardly-projecting, oval-shaped, chitinous folds, each of which carries numerous conical, teeth-like projections (Plate IV, fig. 22).

A transverse section of the gizzard (Plate IV, fig. 23) showed that the organ is lined internally by a chitinous intima which is relatively thick and produced into the previously mentioned oval-shaped folds having the teeth-like projections. External to the intima is a layer of flat epithelial cells, the outer ends of which rest upon a very thin basement membrane. A thick muscular sheath of circular fibres runs continuously around the organ and is interrupted at intervals by longitudinal muscle. The folds are occupied by circular muscle fibres to the inside and longitudinal muscle to the outside.

At the junction of the fore- and mid-intestines, there is a constriction.

The mesenteron

The mid-intestine consists of a single tube, the ventriculus or stomach. The latter is a long tube, of wide and almost uniform calibre, and is transversely constricted along its course. It extends from the posterior end of the proventriculus at the anterior margin of the metathorax down to the hind margin of the sixth abdominal segment.

The proctodaeum

In the seventh abdominal segment, the posterior end of the ventriculus is slightly constricted. Starting from this constriction, the hind-intestine extends down to the anus. The proctodaeum is differentiated, by means of two constrictions, into 3 successive sections ; the ileum, the colon, and the rectum.

The ileum is a rather narrow, cup-shaped tube occupying about half of the seventh abdominal segment.

The colon is the longer, wider, pear-shaped chamber that follows the ileum. It extends from the middle of the seventh abdominal segment down to the hind margin of the eighth.

The rectum is the largest and hindermost chamber of the hind-intestine. It is more or less globular and extends from the posterior end of the colon down to the anal opening situated at the distal extremity of the tenth

abdominal segment Its walls receive the dead ends of the Malpighian tubules.

(G) The Malpighian tubes

(Plate IV, fig. 21)

Opening into the anterior part of the ileum, on the ventro-lateral portion, is a small, bladder-like excretory chamber on either side. Leading cephalad from each bladder, is a short common duct, which splits immediately into two branches; one branch continues cephalad on the ventral side of the ventriculus, while the other branch passes dorsad and divides after a rather long distance into two branches, both of which proceed cephalad, one dorso-laterally and the other laterally, along the ventriculus. Thus three Malpighian tubules are found along each side of the ventriculus; one lying ventrally, the second dorso-laterally, and the third laterally. The ventral Malpighian tubule extends cephalad in a nearly straight line to the third abdominal segment where it turns abruptly outwards and backwards and continues caudad until it reaches the seventh abdominal segment. From this point, the tube runs very convolutedly backwards until it enters the anterior part of the ventral rectal wall. The dorso-lateral Malpighian tubule proceeds cephalad until the third abdominal segment where it turns inwards and backwards. The lateral Malpighian tubule extends cephalad, and parallel to the dorso-lateral tubule, until it reaches the second abdominal segment, where it turns outwards and backwards. After turning, both the dorso-lateral and the lateral tubules proceed caudad, and parallel with their cephalad-extending portions, until they reach the seventh abdominal segment where they become highly convoluted and run backwards to enter the wall of the rectum at its anterior part. The dorso-lateral tubule enters the dorsal rectal wall, while the lateral tubule enters the ventral wall lateral to the entry of the ventral Malpighian tubule. The terminal ends of the Malpighian tubules only enter the walls of the rectum and do not open into the latter's lumen. Where it enters the rectal wall, each tubule forms a small papilla-like projection.

(H) The glands

The glands include the mandibular glands and the labial, or silk, glands; the prothoracic gland is wanting.

The mandibular glands

Each mandible is provided with a long, narrow tube, the mandibular gland (Plate V, fig. 24). The latter begins blindly from about the third abdominal segment, and extends anteriorly alongside the alimentary canal, highly convoluted upon itself, until it ends at the anterior extremity of the

head close to the apodeme of the mandibular adductor muscle. The distal extremity of the tube communicates with the buccal cavity by means of a pore situated on the inner side of the base of the mandible.

The labial or silk glands

The silk glands are two in number. Each gland (Plate IV, fig. 21, and Plate V, fig. 25) starts as an elongate, cylindrical, convoluted tube whose posterior free end is blind. This tube runs cephalad dorsally alongside the alimentary canal from about the seventh abdominal segment up to the second. At this point, the tube swells out forming a silk reservoir which extends ventro-lateral to the alimentary canal and runs forward for a short distance, then it bends and proceeds backwards again down to the sixth abdominal segment where it turns forwards and runs cephalad for the second time until it reaches the hind margin of the metathorax. Here, the silk reservoir turns mesally and gradually narrows. In the metathorax, the narrowed anterior end of the reservoir proceeds forwards as a long thread-like silk duct. The two silk ducts traverse the thoracic segments alongside the ventral nerve cord, converging as they proceed forwards. They pass through the head until they reach the sub-oesophageal ganglion, beneath which they run side by side. Shortly in front of this ganglion, the two silk ducts become enveloped in a common muscular sheath, but they keep still separate. They proceed forwards as such along the medio-ventral line of the body until just before the organ known as the silk press where they unite with each other forming a very short common duct that opens into the base of the silk press. The latter lies inside the pre-mentum, and its dorsal wall is deeply invaginated into the lumen of the organ and contains a median sclerotic bar, or raphe, on which are inserted the dilator muscles having their origins on the dorso-lateral parts of the pre-mentum. From the silk press extends anteriorly a narrow terminal duct that opens at the tip of the spinneret.

The silk glands consist of a single layer of very large secretory cells disposed around a central cavity. The cells have large branched nuclei, and are limited exteriorly by a basement membrane. Internally, the gland cavity is lined by a spirally-thickened chitinous intima.

The silk ducts, as shown in Plate V, figure 25, possess the same structure as the silk glands, except that the epithelial cells are more elongated and flattened and their nuclei are ovoid, and the chitinous intima is closely striated radially.

Located inside the pre-mentum, is a pair of proportionately large, voluminous glands, the accessory (or Filippi's) glands. Each accessory gland opens separately by means of a short duct into the silk duct of its side just before the beginning of the common silk duct.

(I) The nervous system

The nervous system is divided into two main divisions; the central nervous system, and the visceral, or sympathetic, nervous system.

The central nervous system

It is composed of the brain, the sub-oesophageal ganglion, and the ventral nerve cord.

The brain
(Plate V, figs. 26 and 27)

The brain is a small whitish body that lies inside the head and rests on the medio-dorsal surface of the fore-intestine. Its median line is deeply incised giving the organ a bilobed appearance. Each lobe is narrowed anteriorly and rounded posteriorly so that it appears pear-shaped.

Arising ventrally and laterally from each lobe, is a stout connecting nerve, the para-oesophageal connective, which runs around the side of the oesophagus to join the sub-oesophageal ganglion that lies immediately below the fore-intestine.

Just in front of the para-oesophageal connectives, another connecting nerve arises from the brain. This is the sub-oesophageal commissure, which encircles the oesophagus laterally and ventrally and joins the two halves of the brain together.

In front of the origin of the previously mentioned connecting nerves, each lobe of the brain gives off anteriorly three large nerves which proceed forewards along the pharynx. The outer of these nerves is the optic nerve, which gives fine branches to the group of ocelli of its side. The middle nerve is the antennary, which runs to the base of the corresponding antenna. The innermost nerve is the labro-frontal, which divides, after a rather long distance from its origin, into two branches; the outer branch, the labral nerve, runs forwards to the labrum, while the inner branch, the frontal ganglion connective, turns mesally to join the frontal ganglion of the oesophageal sympathetic nervous system at the medio-dorsal line of the pharynx.

Coming out from each lobe of the brain, just behind the origin of the para-oesophageal connective, is a slender nerve, the nervus lateralis, which proceeds forwards to the dorsal region of the head.

The sub-oesophageal ganglion
(Plate V, figs. 26 and 28)

The sub-oesophageal ganglion lies underneath the oesophagus and the posterior tentorial bridge. It is situated at the medio-ventral line in the posterior part of the head, and is connected to the brain by the para-oesophageal connectives, and to the first ganglion of the ventral nerve cord by a pair of very short connectives.

From the sub-oesophageal ganglion come out four pairs of nerves. Three pairs of these nerves arise from the antero-lateral portion of the ganglion just behind the origin of the para-oesophageal connectives, and they run forwards to the mouth parts. The fourth pair of nerves, the lateral nerves, arise from the medio-lateral portion of the ganglion, and proceed laterally to the muscles of the neck region. Of the three pairs of anterior nerves going to the mouth parts, the outermost, the mandibular nerves, innervate the mandibles and their muscles. The middle pair, the maxillary nerves, run to the maxillae; while the third pair, the labial nerves, innervate the region of the labium.

The ventral nerve cord

(Plate V, figs. 28 and 29)

The ventral nerve cord lies on the median ventral line of the body, and is composed of eleven ganglia. The thorax contains three ganglia, one to each segment; while the abdomen contains eight ganglia, one to each of the first six abdominal segments, and the seventh abdominal segment includes two adjacent ganglia.

The ganglia of the ventral nerve cord are connected with each other by a pair of longitudinal connectives. The latter appear wide apart in the thorax. In the abdomen, the double connectives fuse together except for a small part immediately in front of each ganglion. The connectives which join the third thoracic and the first abdominal ganglia are much shorter than the other connectives between other ganglia.

From each of the thoracic and the first seven abdominal ganglia come out two pairs of nerves; an anterior pair arising from the dorso-lateral part of the ganglion and running across the muscles of the segment concerned, and a posterior pair which originates from the ganglion ventro-laterally and proceeds over the segmental muscles. In the second and third thoracic ganglia, the anterior nerves arise from the corresponding ganglion, so close to the origin of the longitudinal connectives, that they appear to be arising directly from the latter in front of the ganglion, then each anterior nerve curves laterally and outwards at an almost right angle and gives off a branch that unites with the lateral nerve of the ventral sympathetic nervous system of the preceding ganglion. Each posterior nerve arising from the thoracic ganglion gives off, within a short distance of its origin, a branch that innervates the corresponding leg.

The last, or eighth, abdominal ganglion is different from the preceding ganglia in that two pairs of large nerves originate from its posterior end. These nerves proceed backwards to, and innervate, the succeeding segments of the abdomen and their constituent organs.

The sympathetic nervous system

The sympathetic nervous system includes the oesophageal sympathetic, the ventral sympathetic, and the peripheral sensory nervous systems. Only the first two systems will be dealt with in this work.

The oesophageal sympathetic nervous system

(Plate V, figs. 26 and 27)

This system consists of a frontal ganglion lying in front of the brain above the medio-dorsal line of the pharynx. To this ganglion is connected the frontal ganglion connective of the labro-frontal nerve. Arising from the posterior edge of the frontal ganglion is the recurrent nerve which extends caudad over the median dorsal line of the fore-intestine, then under the brain and the aorta up to the rear end of the crop where it bifurcates. Each of the two resulting branches diverges outwards and downwards to extend over the surface of the stomach. The recurrent nerve gives off, along its course, slender lateral branches to the oesophagus and the crop.

On each side of the oesophagus, close to the brain, there is another ganglion, the oesophageal ganglion, which is connected from one end to the brain by means of a slender nerve, and from the other end of the ganglion comes out another slender nerve which joins the previously mentioned nervus lateralis coming out from the brain.

The oesophageal ganglion is connected on each side to a small globular body, the *corpus allatum*, which is now generally regarded as an organ of internal secretion.

The ventral sympathetic nervous system

(Plate V, figs. 28 and 29)

The ventral sympathetic nervous system consists of a median nerve arising from the posterior part of each of the ventral nerve cord ganglia except the last. This median nerve runs backwards, between the longitudinal connectives, until it reaches near to the following ganglion, where it bifurcates into two lateral nerves which diverge horizontally outwards to the neighbourhood of the spiracles.

As previously mentioned, the lateral nerves of the second and third thoracic ganglia are connected to a branch of the anterior nerve of the corresponding ganglion on each side.

(J) The circulatory system

The only contained vessel is the dorsal vessel situated beneath the integument along the median dorsal line. It extends from the ninth abdominal

segment to the anterior extremity of the head, and is differentiated into the heart and the aorta.

The heart (Plate V, fig. 30) is the wide, flattened part of the dorsal vessel that begins with a closed chamber at the anterior margin of the ninth abdominal segment and proceeds forwards to the anterior margin of the mesothorax. In the abdomen, the heart is suspended from the dorsal body wall and held firmly in place by means of fine suspensory threads that go upward and outward from its dorsal wall. In the meta- and mesothorax, the heart leaves the dorsal body wall to extend upon the fore-intestine.

There are eight pairs of alary muscles, a pair in each of the abdominal segments 2 to 9. The alary muscle is a group of transversely-striated muscle fibres, all of which are attached from the outer end to a point on the side of the corresponding tergum. Then, spreading fan-wise, the fibres are inserted on the ventral wall of the heart.

In the regions of the alary muscles, the heart is dilated, and thus eight chambers could easily be recognised.

Starting from the prothorax, the heart looses much of its diameter and forms the aorta. The latter is a slender tube extending in the prothorax and head close to the dorsal surface of the fore-intestine. Passing under the brain, the aorta ends at the anterior extremity of the head by an open mouth.

There is only a dorsal diaphragm which is membranous and appears to be confined to the regions of, and to a small area alongside the heart between, the alary muscles. The writer has searched carefully for such a membrane and did not find it elsewhere.

(K) The wing-buds

Located in each of the meso- and the metathoracic segments, is a pair of small, white, kidney-shaped bodies (Plate V, fig. 35). These are the imaginal buds of the future wings of the adult moth. Each bud lies, obscured by fat bodies and muscles, just beneath the dorsal body wall in the lateral portion of the corresponding segment.

(L) The respiratory system

The tracheal system is of the peripneustic type.

The spiracles

There are nine pairs of spiracles, all of which are functional. The first pair is situated on the sides of the posterior part of the prothorax. The next eight pairs are located on the lateral parts of the first eight abdominal segments, one pair to each segment, at a higher level than that of the prothoracic pair. Each of the first seven pairs of abdominal spiracles lies on the anterior part of its segment; while the eighth abdominal pair, which is the

largest of all the spiracles, is situated on the posterior part of the corresponding segment.

Each spiracle (Plate V, figs. 31-34) consists of an oval opening contained in a small sclerotic plate of the body wall, the peritreme. This opening leads into a tubular chamber, the atrium, which opens to the exterior by an atrial orifice, and into the spiracular trachea by a tracheal orifice. The atrium is differentiated into an outer and an inner chamber. From the walls of the outer chamber into its lumen, project cuticular processes that are thickly clothed with interlacing hairs. These processes are small in the anterior part of the chamber, but, at the posterior part, they become large and arboreous with intermingled branches, thus forming a most efficient filter apparatus. The walls of the inner atrial chamber are devoid of such processes but are strengthened with circular ridges which are not true taenidia.

The tracheal closing apparatus

At the inner extremity of the atrium, the tracheal orifice is regulated by a closing apparatus. The latter (Plate V, figs. 32-34) consists of a bow, a valve, and a lever. The structure of the closing apparatus is the same in the thoracic and the abdominal spiracles except that the lever and valve are posterior in the abdominal spiracles and anterior in the thoracic ones.

The closing bow is an elastic crescentic bar; while the valve is a membranous fold projecting into the atrial lumen from the wall opposite the bow. The lever, which extends on the valve and is attached to the outer edge of the bow, consists of two slender bars running parallel to each other up to nearly halfway of the atrial wall, where the two bars unite and give rise to a free arm which diverges outwards at an almost 45° angle.

An occlusor muscle runs between the distal extremity of the lever's free arm and the inner edge of the closing bow. The contraction of this muscle and its pull on the lever's free arm brings the valve into a deep concavity of the posterior atrial wall; thus closing the tracheal orifice.

The opening of the spiracle is effected by a dorsal and a ventral dilator muscles. The dorsal dilator muscle arises on the dorsal body wall and is inserted on the distal end of the lever's free arm. Arising on the ventral body wall, the ventral dilator muscle is inserted ventrally on the inner end of the closing bow.

The tracheae

(Plate V, fig. 35)

On either side of the body there is a longitudinal tracheal trunk (*L*) starting from the prothoracic spiracle and running backwards to end in the seventh abdominal segment. Into these two main trunks open the spiracular tracheae arising from the prothoracic and the first seven abdominal spira-

cles. The spiracular trachea of the eighth abdominal spiracle opens into the main longitudinal trunk of its side near the posterior margin of the sixth abdominal segment.

Tracheae arising in the mesothorax

At the prothoracic spiracle, three main tracheae arise from the longitudinal trunk ; two of them *(I 1* and *I 2)* proceed anteriorly towards the head, while the third *(I 3)* runs posteriorly towards the mesothorax.

The first anterior trachea *(I 1)* divides shortly in front of the spiracle into two branches, an outer *(I 1A)* and an inner *(I 1B)*. The outer branch *(I 1A)* divides again into two unequal branches : the larger trachea *(I $1A_1$)* unites with its fellow of the opposite side in the posterior dorsal part of the head to form the first transverse dorsal commissure *(T.D.C. 1)*, from the apex of which are given branches to the mandibular muscles, the dorsal head wall, the dorsal surface of the pharynx, and the labrum ; the smaller trachea *(I $1A_2$)* meets the corresponding trachea of the opposite side in the prothorax to form the second transverse dorsal commissure *(T.D.C.2)* which gives off a small branch to supply the aorta. The inner branch *(I 1B)* enters the side of the head and subdivides into several branches that supply the lateral parts of the head, the mandible, the maxilla, and the labium.

The second anterior trachea *(I 2)* divides into three branches *(I 2A*, *I 2B*, and *I 2C)*. The first branch *(I 2A)* proceeds to the head and gives branches to the side of the head, the maxilla and the brain, and a small branch of it extends mesally to meet its fellow of the opposite side over the sub-oesophageal ganglion to form the first transverse ventral commissure *(T.V.C.1)* which supplies the mentioned ganglion. The second branch *(I 2B)* bifurcates into an inner *(I $2B_2$)* and an outer branch *(I $2B_1$)* : the inner branch *(I $2B_2$)* unites with the corresponding branch of the opposite side to form the second transverse ventral commissure *(T.V.C.2)* which extends under, and supplies, the prothoracic ganglion ; whereas the outer branch *(I $2B_1$)* gives several branches to the prothoracic muscles. The third branch *(I 2C)* bifurcates : the first branch *(I $2C_1$)* supplies the fore-intestine ; and the other *(I $2C_2$)* goes to the prothoracic leg and muscles.

The third, or posterior, trachea *(I 3)* extends backwards giving off branches to the mesothoracic legs *(I 3A)* and the mesothoracic muscles *(I 3B)*, and a branch of it *(I 3C)* extends mesally to join the second transverse dorsal commissure forming with it an X-shaped structure.

Tracheae arising in the prothorax

From the main longitudinal trunk comes out a small branch *(II 1)* which runs under the ventral nerve cord to meet its fellow of the opposite

side forming the transverse ventral commissure of the mesothorax *(T.V.C. 3)* The latter supplies the muscles, leg and ganglion of the segment.

Tracheae arising in the metathorax

Two tracheae *(III 1 and III 2)* arise from the main longitudinal tracheal trunk.

The first trachea *(III 1)* divides immediately into two branches : the first of which *(III 1A)* proceeds forwards and supplies the muscles of the mesothorax; while the second branch *(III 1B)* dilates and curves upwards and inwards to give many minute tracheal branches to the dorsal surface of the oesophagus and crop, and to the fat bodies. From the beginning of this dilated branch *(III 1B)* comes out also a dilated trachea *(III $1B_1$)* which supplies the dorsal mesothoracic wall and its muscles.

The second trachea *(III 2)* extends mesally to supply the meso-thoracic sternal muscles and ganglion.

A third trachea *(III 3)* comes out also from the main longitudinal trunk and extends mesally under the sternal muscles and the ventral nerve cord to join its fellow of the opposite side forming the transverse ventral commsisure of the metathorax *(T.V.C. 4)*. The latter gives branches to the mesothoracic ganglion and legs.

Near the end of the longitudinal tracheal trunk in the metathorax, another trachea *(III 4)* is given off mesally which supplies the metathoracic muscles and ganglion and the muscles of the first abdominal segment.

Tracheae arising in the first abdominal segment

From the main longitudinal trunk come out four tracheae : one dorsal *(IV 1)*, two ventral *(IV 2* and *IV 3)*, and one visceral *(IV 4)*.

The dorsal trachea *(IV 1)* bifurcates and supplies the tergal muscles and the heart.

The first ventral trachea *(IV 2)* bifurcates also and supplies the sternal muscles; while the second ventral trachea *(IV 3)* extends mesally and supplies the sternum and the ventral nerve cord.

The visceral trachea *(IV 4)* curves inwards and upwards, then branches into two branches *(IV 4A* and *IV 4B)*. The first branch *(IV 4A)* dilates after a short distance and proceeds forwards on the side of the stomach's anterior part up to the hinder half of the crop giving these structures and the fat bodies many minute tracheal branches. The second branch *(IV 4B)* divides into two branches *(IV $4B_1$ and IV $4B_2$)* : the first *(IV $4B_1$)* dilates immediately and proceeds forwards on the ventral side from the stomach's anterior part up to the crop, and sending minute branches to the previously mentioned organs; while the second branch *(IV $4B_2$)* dilates also and proceeds poster-

iorly under the stomach up to its anterior third and gives it minute branches.

From the main longitudinal trunk is given also a trachea *(IV 5)* which extends inwards under the muscles and the ventral nerve cord to join its fellow of the opposite side forming the transverse ventral commissure of the first abdominal segment *(T.V.C. 5)*.

Tracheae arising in the second abdominal segment

From the main longitudinal trunk come out three tracheae; one dorsal *(V 1)* to the tergum and the heart, the second ventral *(V 2)* to the sternum and the ventral nerve cord, and the third visceral *(V 3)*. The latter curves upwards, then bifurcates into two branches *(V 3A* and *V 3B)* : the first branch *(V 3A)* dilates after a short distance and proceeds forwards on the dorsal side of the stomach up to the latter's anterior third giving it numerous minute branches; while the second branch *(V 3B)* dilates immediately and extends posteriorly on the dorsal side of the stomach up to its middle and sends numerous slender branches to that organ and to the Malpighian tubules. From the beginning of the branch *(V 3B)* comes out a somewhat dilated trachea *(V $3B_1$)* that extends downwards giving numerous small branches to the silk reservoir and the fat bodies.

Coming out from the main longitudinal trunk is another trachea *(V 4)* which extends mesally to join its fellow of the opposite side forming the transverse ventral commissure of the segment *(T.V.C. 6)*.

Tracheae arising in the third abdominal segment

Here we get the same system of tracheae as is in the second abdominal segment *(VI 1* to *VI 4)*, except that the visceral trachea *(VI 3)* extends upwards and inwards, then dilates and runs posteriorly on the ventral side of the stomach up to the latter's hinder third giving it and the Malpighian tubules numerous small branches. From the beginning of the dilated visceral trachea comes out also a small trachea *(VI 3A)* that supplies the silk reservoir and the fat bodies with numerous slender branches.

The transverse ventral commissure of the segment *(T.V.C. 7)* supplies the prolegs and the ganglion of the ventral nerve cord.

Tracheae arising in the fourth abdominal segment

The same system of tracheae is found *(VII 1* to *VII 4)*, except that the visceral trachea *(VII 3)* extends upwards and inwards, then dilates and runs backwards on the ventral side of the stomach down to the latter's

middle and gives numerous branches to the dorsal and ventral sides of the stomach and to the fat bodies, the silk gland, and the Malpighian tubules.

Tracheae arising in the fifth abdominal segment

The same system of tracheae occurs *(VIII 1* to *VIII 4)*, except that the visceral trachea *(VIII 3)* turns upwards and inwards, then dilates and runs posteriorly on the dorsal side of the stomach down to the latter's hinder end and gives numerous minute branches to the dorsal and ventral sides of the stomach and to the Malpighian tubes and fat bodies.

Tracheae arising in the sixth abdominal segment

The same tracheae *(IX 1* to *IX 4)* are found, but the visceral trachea *(IX 3)* extends upwards and inwards, then dilates and runs transversely inwards to the hinder part of the stomach and gives small branches to the dorsal and ventral sides of the latter, to the Malpighian tubules and to the fat bodies.

From the main longitudinal trunk, near the hinder margin of the sixth abdominal segment, comes out a fifth trachea *(IX 5)* which extends posteriorly to the seventh abdominal segment where it runs horizontally inwards under the sternal muscles and the ventral nerve cord to join its fellow of the opposite side forming the transverse ventral commissure of the seventh abdominal segment *(T.V.C. 11)*.

Tracheae arising in the seventh abdominal segment

In this segment, the main longitudinal trunk ends, then gives off two large dilated tracheae *(X 1* and *X 2)* that run posteriorly in the succeeding abdominal segments down to the tenth. The outer of these two tracheae *(X 1)* runs backwards to end on the dorsal side of the rectum, and it gives numerous small branches to the rectal dorsal and ventral sides, to the Malpighian tubules, the fat bodies and the colon. The inner trachea *(X 2)* extends posteriorly to end in the anal proleg, and gives many slender branches to the fat bodies, the ileum, the colon, the Malpighian tubules and the ventral surface of the rectum.

Tracheae arising in the eighth abdominal segment

The spiracular trachea *(SP. T.8)* coming out from the eighth abdominal spiracle extends anteriorly to the seventh abdominal segment where

it convolutes and then proceeds forwards again to open into the main longitudinal trunk in the sixth abdominal segment near the origin of the transverse ventral commissure of the seventh abdominal segment. From this spiracular trachea, immediately in front of the spiracle, comes out a slender trachea *(T)* which shortly bifurcates giving rise to two thread-like tracheae *(T_1 and T_2)*. The two latter extend backwards, then dilate near the rectum, and one of them goes to the dorsal side of the rectum, while the other goes to the latter's ventral side.

(M) The reproductive system

The female reproductive system (Plate V, fig. 36) consists of a pair of gonads located in the fifth abdominal segment immediately under the dorsal integument alongside the median line. The female gonad is an almost triangular body held in place by means of fat bodies and minute tracheal branches. From the narrow posterior end of each gonad comes out a slender duct which proceeds backwards to near the hind margin of the seventh abdominal segment where it curves abruptly inwards and downwards. Then the duct proceeds mesally across the sternal muscles of the seventh abdominal segment, and almost parallel to the latter's transverse ventral tracheal commissure, up to near the ventral median line where the duct slightly dilates forming a small vesicle which unites with its fellow of the opposite side at the ventral median line.

The male reproductive system (Plate V, fig. 37) includes a pair of gonads located in the same position as that of the female gonads. Each male gonad is kidney-shaped and is slightly larger than that of the female. From the middle of the inner dorsal side of each male gonad comes out a slender duct, the future vas deferens. The latter extends posteriorly alongside the dorsal median line up to the ninth abdominal segment where the duct converges inwards and downwards to open into the anterior lateral part of a common funnel-shaped vesicle situated immediately over the ventral integument of the ninth abdominal segment at the median line. This common vesicle gives rise posteriorly to a relatively large canal that opens to the exterior near the posterior margin of the ninth abdominal sternum.

It was impossible to determine the larval sex by any external feature, except that the male larva is slightly smaller in size than the female, which, however, was impracticable and could not be trusted as a means of sex determination.

Transverse sections of the gonads revealed that there are four tubules in each sex; testicular follicles (or sperm tubes) in the male, and egg or ovarian tubes in the female. These tubules are invested in a thick, spongy, outer cellular sheath which is bounded externally by a thin basement mem-

brane. The testicular follicles are transversely arranged in two rows of two follicles each; while the egg-tubes are longitudinally arranged in one row. Each sperm tube, enclosing the male germ cells, is enveloped, separately from the other tubes, by a cellular inner epithelial sheath. The egg-tubes, containing the female germ cells, are all confined together inside a common inner sheath which also forms a separate epithelial layer around each tube.

SUMMARY

(A) Former and present works on the artificial rearing of *Galleria mellonella* L., are shortly discussed.

(B) External features of all stages of the insect are described.

(C) The life-history in Egypt is given under natural conditions of temperature and humidity.

(1) There are 4 overlapping generations every year; first generation appears April-August, second generation appears July-October, third generation appears September-December, and fourth generation appears October-June.

(2) Eggs are laid in cracks and crevices in the hive. Individual fertilised females laid 500-1813 eggs. Incubation period of eggs is 17, 9, 9, and 10 days respectively for the 4 generations.

(3) Individual unmated females laid 182 to 462 eggs that never hatched.

(4) The length of larval stage ranged from 42-70, 37-68, 39-62, and 98-225 days, respectively, for the 4 generations.

(5) Larvae showed 9 ecdyses. The average lengths of the 9 stadia were 5.5, 4.6, 4.1, 3.4, 3.15, 4.45, 4.85, 5.3, and 8.2 days, respectively. Measurements and description of the larva at the different stadia are given.

(6) The duration of the pupal stage ranged from 8-11, 8-11, 9-23, and 12-49 days respectively for the 4 generations. There is a marked relation between the length of pupal life and sex of moth; the duration for the male pupae being one day less than that of the female ones.

(7) The longevity of starved moths in captivity ranged from 21-30 days for males and 8-15 days for females. Percentage of male moths ranged from 49.2 to 52.9. Male moths always emerged before females. Moths emerged and mated during day-time as well as at night. Copulation lasted for 3-5 1/3 hours with an average of 3 3/4 hours.

(8) Quantity of wax consumed by the larvae resulting from the eggs of a fertilised female varied from 500-665 grams; a single larva during its life-time consumed 1.36-1.57 grams, with a mean of 1.48 grams.

(D) An external and internal morphology of the last-instar larva is described in detail.

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Explanation of Plate I

Fig. 1 : The external structure of the eggs.
Fig. 2 : The last-instar larva, lateral aspect.
Fig. 3 : *A*, group of cocoons; *B*, *C*, and *D*, a cocoon with an operculum of 1, 2, and 3 flaps respectively.
Fig. 4 : *A*, male pupa, dorsal aspect; *B*, hinder segments of same, ventral aspect; *C*, female pupa, ventral aspect.

(*a*, antenna; *a. bc. o*, common genital aperture of female; *c*, clypeus; cx_1-cx_3, coxae of legs; *e*, eye; *f*, frons; fm_1, femur of prothoracic leg; *g.a*, male genital aperture; *l*, labrum; *l.p*, labial palp; *md*, mandible; *sp*, spiracle; tb_1-tb_2, tibiae of first and second thoracic legs; ts_1-ts_3, tarsi of first to third thoracic legs; w_1-w_2, anterior and posterior wings; *1-3*, thoracic segments; *I-X*, abdominal segments).

Fig. 5 : The female moth.
Fig. 6 : The male moth.

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Plate I

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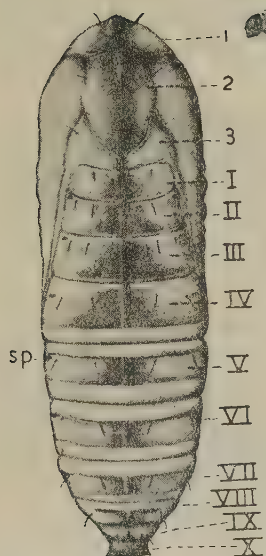
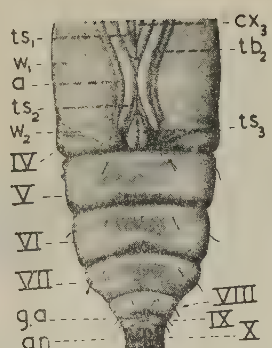
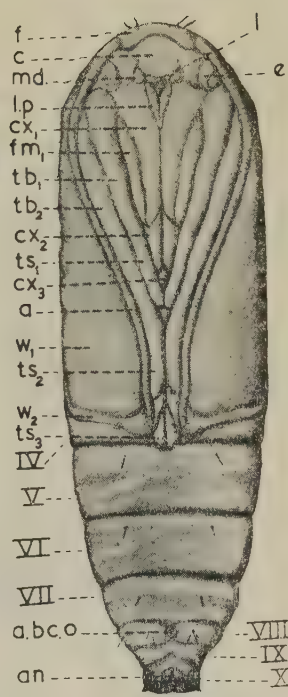

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Explanation of Plate II

Fig. 7 : The head, dorsal aspect.

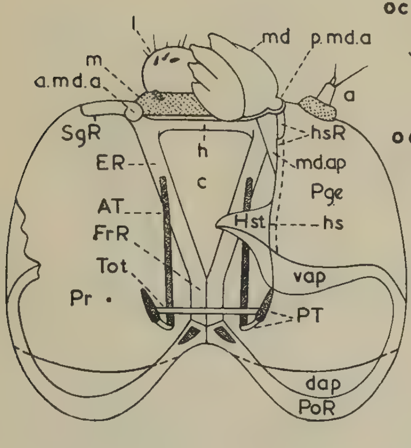
(*a*, antenna; *ad*, adfrontal; *at*, anterior tentorial pits; *c*, clypeus; *es*, epistomal suture; *Fr*, frontal groove; *fs*, frontal suture; *l*, labrum; *m*, membranous area; *md*, mandible; *mx*, terminal part of maxilla; oc_1-oc_2, dorso-lateral ocelli; *p*, puncture; *Pr*, parietal; *1-10*, setae of parietal).

Fig. 8 : The head, ventral aspect.

(*a*, antenna; *cd*, cardo; *hs*, hypostomal suture; *Hst*, hypostoma; *Hyp*, hypopharynx; *l*, labrum; *lb.p*, labial palp; *md*, mandible; *mn*, mentum; *mx.l*, maxillary lobe; *mx.p*, maxillary palp; oc_1-oc_2, dorso-lateral ocelli; oc_3-oc_4, ventro-lateral ocelli; *p*, puncture; *pf*, palpifer; *pg*, palpiger; *Pge*, postgena; *pm*, prementum; *sbm*, submentum; *spn*, spinneret; *SR*, stipital ridge; *st*, stipes; *11-16*, setae of postgena).

Fig. 9 : The head, ventral aspect, with the maxillae, labium and the right half of ventral head wall cut away to show the tentorium and the internal ridges.

(*a*, antenna; *a. md. a*, anterior mandibular articulation; *AT*, anterior tentorial arm; *c*, clypeus; *dap*, dorsal postoccipital apodeme; *ER*, epistomal ridge; *Fr. R*, frontal ridge; *h*, anterior ridge of clypeus; *hs*, hypostomal suture; *hs R*, hypostomal ridge; *Hst*, hypostoma; *l*, labrum; *m*, membranous area; *md*, mandible; *md. ap*, base of mandibular adductor apodeme; *p. md. a*, posterior mandibular articulation; *Pge*, postgena; *PoR*, postoccipital ridge; *Pr*, parietal; *PT*, posterior tentorial arm; *Sg R*, subgenal ridge; *Tot*, posterior tentorial bridge; *vap*, ventral postoccipital apodeme).



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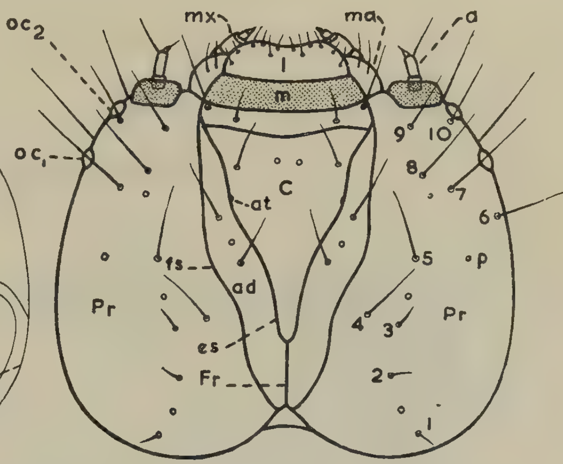

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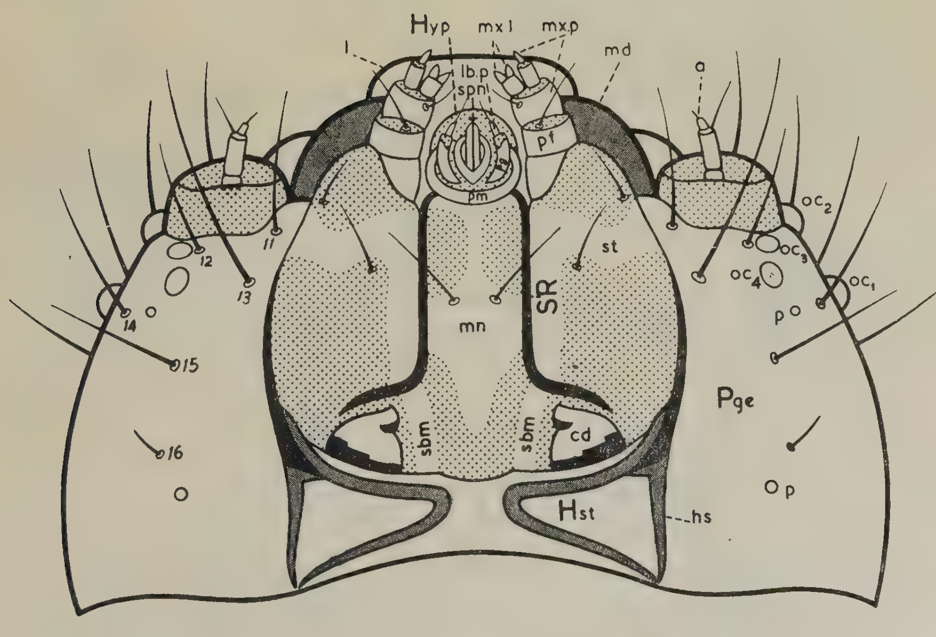

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Explanation of Plate III

Fig. 10 : *A* and *B*, different aspects of the antenna.
(*I-III*, antennal segments; II_1-II_2, trichoid sensillae of second segment; II_3-II_4, basiconic sensillae of same; III_1, styloconic sensilla of third segment; III_2, basiconic sensilla of same).

Fig. 11 : The labrum.
(*A*, dorsal aspect; *B*, ventral aspect; *t*, torma).

Fig. 12 : The right mandible, dorso-lateral aspect.
(*a.md.a.*, anterior mandibular articulation; *p.md.a.*, posterior mandibular articulation).

Fig. 13 : The maxillolabial complex, ventral aspect.
(*cd*, cardo; *lb.p*, labial palp; *mn*, mentum; *mx.l*, maxillary lobe; *mx.p 1-3*, segments of maxillary palp; *pf*, palpifer; *pg*. palpiger; *Pm*, prementum; *sbm*, submentum; *spn*, spinneret; *SR*, stipital ridge; *st*, stipes).

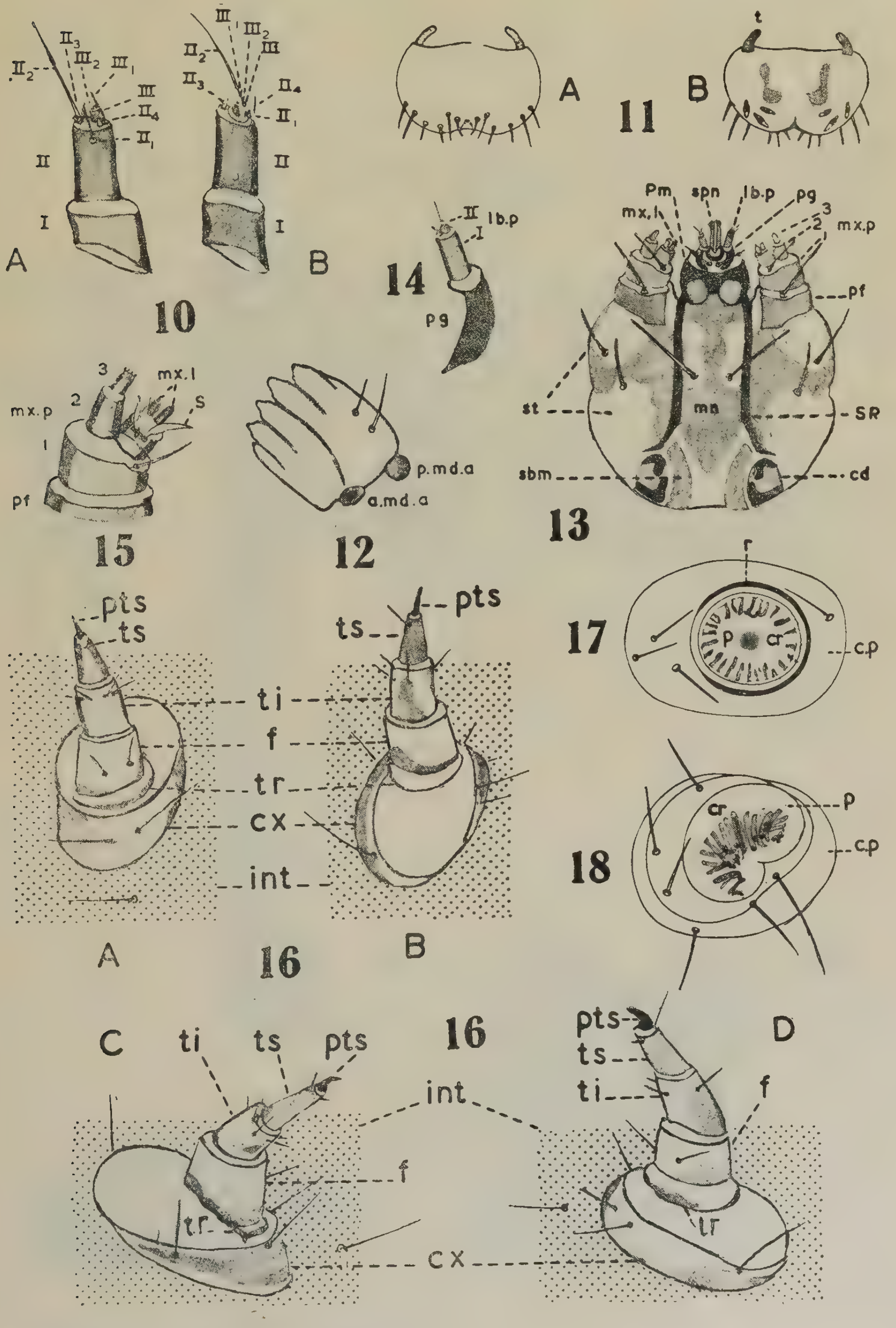
Fig. 14 : The labial palp, ventral aspect.
(*lb.p. I-II*, segments of labial palp; *pg*, palpiger).

Fig. 15 : The maxillary palp and lobe, dorsal aspect.
(*mx.l*, maxillary lobe; *mx.p 1-3*, segments of maxillary palp; *pf*, palpifer; s, styloconic sensilla).

Fig. 16 : Left mesothoracic leg.
(*A*, internal view; *B*, external view; *C*, anterior view; *D*, posterior view; *cx*, coxa; *f*, femur; *int*, ventral integument; *pts*, pretarsus; *ti*, tibia; *tr*, trochanter; *ts*, tarsus).

Fig. 17 : Left first proleg, ventral aspect, frontal view.
(*c.p*. the conical projection; *cr*, crochets; *p*, planta; *r*, sclerotic ring around base of planta).

Fig. 18 : Left anal proleg, ventral aspect, frontal view.
(*c.p*, the conical projection; *cr*, crochets; *p*, planta).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Explanation of Plate IV

Fig. 19 : Setal map of the right half of the three thoracic segments (*1-3*) and the first three abdominal segments (*I-III*).

Fig. 20 : Setal map of the right half of the fourth to tenth abdominal segments (*IV-X*).

Fig. 21 : The alimentary canal, the silk glands, and the Malpighian tubes.

(*c*, crop; *g*, proventriculus; *h*, colon; *il*, ileum; *m*, ventriculus; *m.t*, common duct of Malpighian tubules; $m.t_1$, $m.t_2$, and $m.t_3$, ventral, dorso-lateral, and lateral Malpighian tubules; *oe*. oesophagus; *ph*. pharynx; *r*, rectum; *s.d*, silk duct; *s.g*, silk gland; *S.r*, silk reservoir; *u*, excretory chamber).

Fig. 22 : One of the folds on the inside surface of the gizzard.

Fig. 23 : Portion of a transverse section of gizzard.

(*b.m*, basement membrane; *c*, epithelial cells; *c.m*, circular muscle; *i*, chitinous intima; *l.m*, longitudinal muscle).

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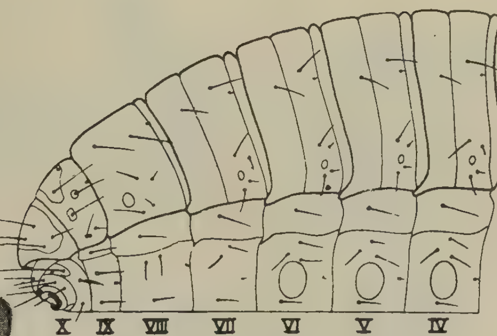
Plate IV



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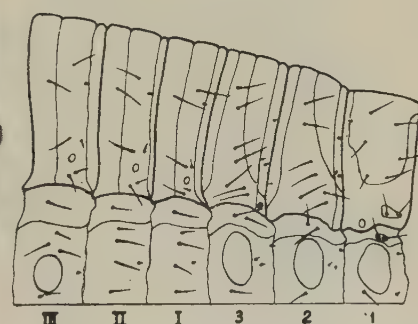

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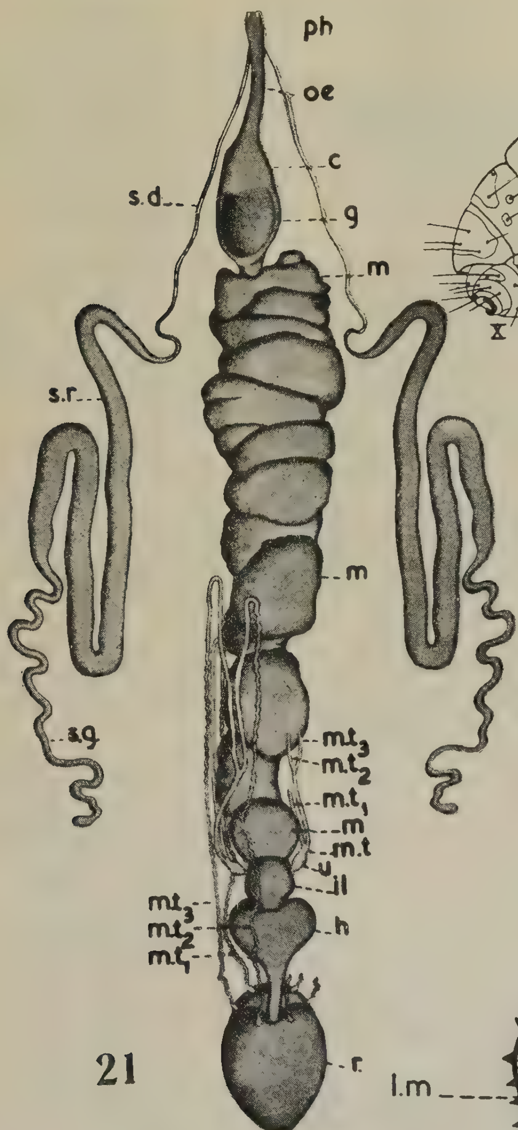

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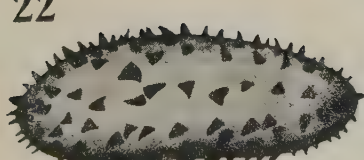

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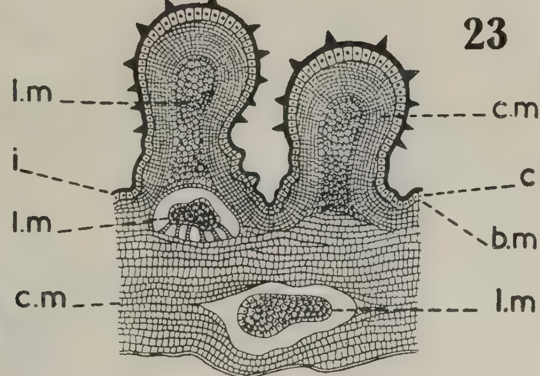

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Explanation of plate V

Fig. 24 : Right mandibular gland.

Fig. 25 : Distal portion of silk ducts, with the epithelial cells omitted anteriorly.
(*A*, adductor muscle of mandible; *ACC.G*, accessory gland; *B*, basement membrane; *C.S.D*, common silk duct; *D*, dorsal wall of silk press; *EP.C*, epithelial cells of silk duct; *G*, mandibular gland; *I*, intima; *L*, lumen; *MD*, mandible; *R*, raphe; *S.D*, silk duct; *SP*, spinneret; *S.PR*, silk press; *T.D*, terminal silk duct).

Fig. 26 : The brain, suboesophageal ganglion, and part of the oesophageal sympathetic nervous system, lateral aspect.

Fig. 27 : The brain and part of the oesophageal sympathetic nervous system, dorsal aspect.
(*A.N*, antennary nerve; *B*, brain; *C.A*, corpus allatum; *F.G*, frontal ganglion; *F.G.C*, frontal ganglion connective; *LB.N*, labial nerve; *L.F.N*, labro-frontal nerve; *L.N*, labral nerve; *MD.N*, mandibular nerve; *MX.N*, maxillary nerve; *N.L*, nervus lateralis; *O.N*, optic nerve; *OE*, oesophagus; *OE.G*, oesophageal ganglion; *P.C*, para-oesophageal connective; *PH*, pharynx; *R*, recurrent nerve; *S.C*, suboesophageal commissure; *S.G*, suboesophageal ganglion; *V.N*, ventral nerve).

Fig. 28 : The suboesophageal ganglion and portion of the ventral nerve cord with the adjacent ventral sympathetic nerves.
(*ab.g 1-2*, first and second abdominal ganglia; *ant.n*, anterior nerve of ganglion; *con*, longitudinal connectives between ganglia; *con.b*, connecting branch between anterior nerve of ganglion and lateral nerve (*lat.n*) of ventral sympathetic system; *post.n*, posterior nerve of ganglion; *th.g 1-3*, thoracic ganglia; other lettering as in fig. 27.

Fig. 29 : Hinder portion of ventral nerve cord.
(*ab.g 6-8*, sixth to eighth abdominal ganglia; *ant.n. 7*, anterior nerve of seventh abdominal ganglion; *lat.n. 6-7*, lateral nerves of sixth and seventh abdominal ganglia; *med.n. 6-7*, median nerve of same; *post.n. 7*, posterior nerve of seventh abdominal ganglion; *I-II*, nerves of eighth abdominal ganglion).

Fig. 30 : Piece of heart and associated organs, ventral aspect.
($al.m_1$-$al.m_2$, alary muscles of second and third abdominal segments; *d.c*, dorsal diaphragm cells; *h*, heart).

Fig. 31 : Posterior view of atrium of eighth abdominal spiracle, showing the filter apparatus (F.AP).

Fig. 32 : Left eighth abdominal spiracle, inner view; posterior aspect, showing muscles of closing apparatus

Fig. 33 : Same, inner view, anterior aspect, showing the bow (*B*) of the closing apparatus.

Fig. 34 : Same, inner view, posterior aspect, showing the inner edge of the bow (*B*), the valve (*V*), and the lever (*L*) of the closing apparatus.
(*A*, atrium; *D.D.M*, dorsal dilator muscle; *O.M*, occlusor muscle; *P*, peritreme; *T*, spiracular trachea; *V.D.M*, ventral dilator muscle).

Fig. 35 : Left half of larva showing tracheal system
(*A.P*, left anal proleg; *H*, head; W_2-W_3, mesothoracic and metathoracic wing buds; *I-III*, thoracic segments; *IV-XIII*, abdominal segments; for other lettering see text).

Fig. 36 : Female reproductive organs.
(*d*, duct; *f.g*, female gonad; *v*, vesicle).

Fig. 37 : Male reproductive organs.
(*c.v*, common vesicle; *c.v.c*, canal of common vesicle; *m.g*, male gonad; *v.d*, future vas deferens).

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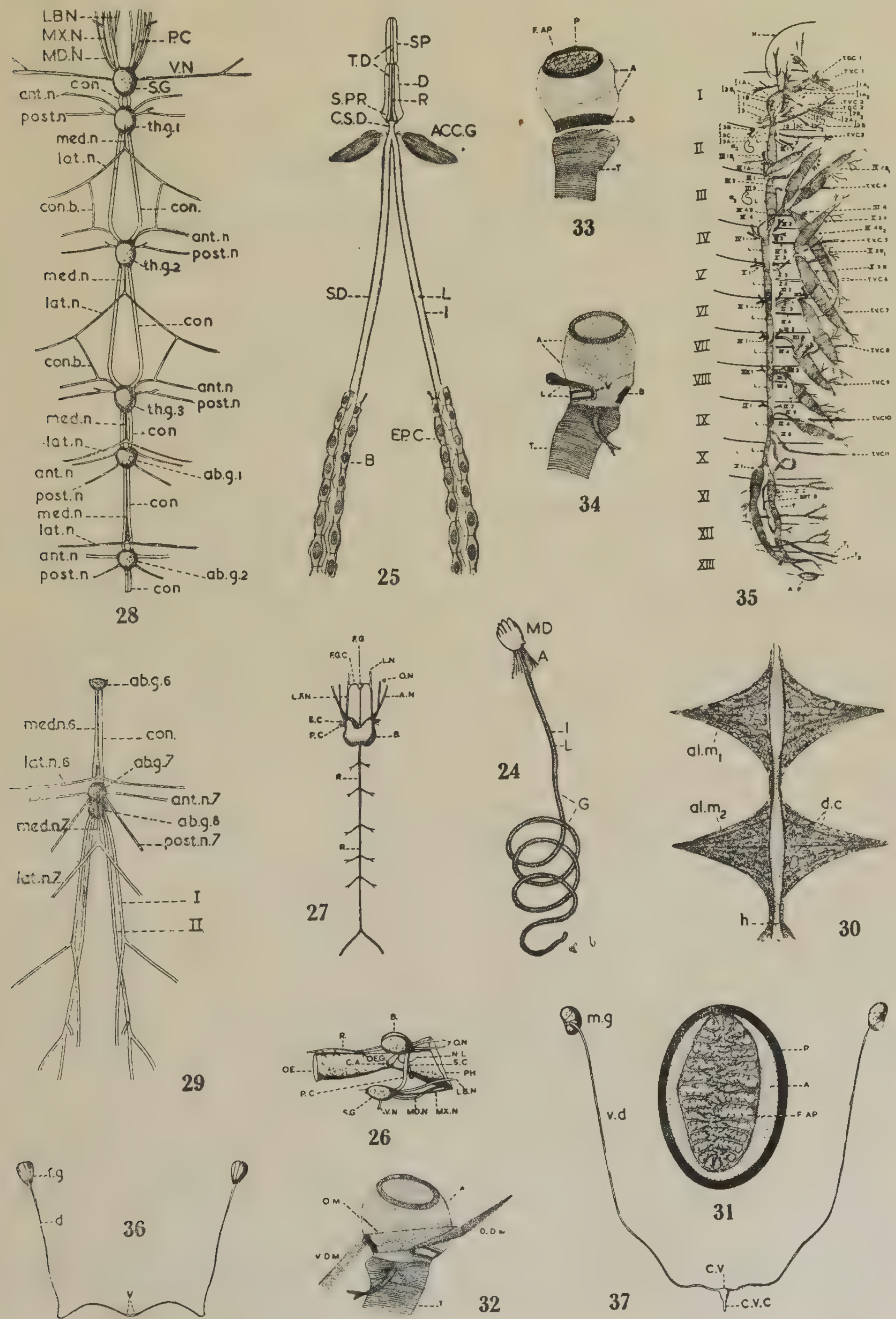
Plate V



The classification and evolution of the spiracular system in insects

(with 5 Text-Figures)

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Department of Entomology,
Faculty of Agriculture, Farouk 1st University.

The following account is only an endeavour to lay down a unified classificatory system for the spiracular apparatus in insects as well as tracing its evolutionary path.

Although the spiracular apparatus in insects is a possible limiting factor in the evolution of the Insecta as a class yet it did not receive much attention from morphologists or evolutionists. This may be due to the wide range of variations presented by these structures and hence the difficulty of their classification as pointed out by Imms (1934).

For this it was thought advisable to find out a classifactory scheme — based on an extensive morphological study of these structures — so as to be applicable to all known forms of spiracular apparatus.

Thus, a large number of insect forms were dissected and sectioned. These showed the occurrence of two groups of spiracular apparatus : (1) an external type, (2) an internal type.

These two types occur commonly on the thoracic spiracles, while the internal one is typical of the abdominal spiracles.

The first consists of a simple slit guarded on either side by parts of the body wall (lids) which may be arched slightly above the surface of the integument. This external type, which alone is represented in many groups of insects, has hitherto been the only one recognised. It has been recorded in the Orthoptera by Krancher (1881) and by Vinal (1919); by Alt 1909) in the metathoracic spiracles of *Dytiscus*, and by Mammen (1912) in the thoracic spiracles of Hemiptera. More recently Snodgrass (1925) described a similar type of "closing apparatus" in the first thoracic spiracle of the honey-bee. In the present investigation it was found in Mecoptera,

in the metathoracic spiracles of Neuroptera and Trichoptera and in the thoracic spiracles of most of the nematocerous diptera.

The second or internal type of spiracular apparatus differs from the external in that the apparatus is situated below the surface of the body and the lids assume different forms of thin elastic membranes. It may consist of (a) well-developed membraneous flaps which can be drawn together over the atrial mouth, as in the thoracic spiracles of Tachinidae and Anthomyidae; (b) it may take the form of flexible regions of the atrial or tracheal wall, devoid of taenidia and similar thickenings, which can be distorted so as to regulate the size of the opening to the trachea, as in the thoracic spiracles of some Brachycera and Pupipara and in all the known types of abdominal regulatory apparatus.

There can be little doubt that the "lid" type represents the more primitive kind of spiracular apparatus since it shows the least advance on the condition found in the Apterygota and Myriapoda. It also seems probable that primitively the closing muscle was attached to one lid only, so that only one lid was movable. Such a state of affairs is of common occurrence in the most generalized pterygote insects, such as Orthoptera and Dermaptera. Thus, in the anterior thoracic spiracle of *Gryllotalpa gryllotalpa* Linné (=*vulgaris* Latr.), *Gryllus campestris* (Krancher 1881), and *Dissosteira caroline* (Vinal 1919, and Snodgrass 1929), one of the stigmatic margins is movable while the other is a rigid elevation of the peritreme or body wall. A similar type of apparatus is said to occur in Dermaptera (Krancher 1881). This hypothesis, that primitively only one lid was movable, receives further support from the work of Mammen (1912), who suggested that, in the primitive "closing apparatus", opening and closing was affected by the muscles of the body wall, especially the intersegmental ones. He maintains that this condition is exemplified by the thoracic spiracles of Hemiptera, where the spiracular opening is situated between the edges of the pro- and mesothorax (anterior thoracic spiracle) or of the meso- and metathorax (posterior thoracic spiracle). A muscle inserted obliquely on a sclerotized band bordering the anterior segment (pro- and mesothorax) closes the spiracle by pulling this band against the rigid edge of the segment behind. In the present work, it was found that in cases where the tracheal system is highly developed, as in the Diptera, the closing muscle is inserted equally on both lids which are equally movable. An apparently transitional type occurs in Mecoptera, Neuroptera and Trichoptera where the posterior thoracic spiracle possesses lids, both of which move, but of which the posterior exhibits relatively little movement compared with the anterior lid. This condition is associated with a somewhat asymmetric insertion of the closing muscle on the bases of the stigmatic lids.

The abdominal apparatus differs markedly in structure from that of the thorax, especially in the higher forms. While exhibiting considerable variation in structure it is in all cases situated below the level of the body surface, as the internal type of thoracic apparatus, and surrounds the tracheal entrance or, very rarely, the trachea itself, in a region devoid of taenidia. Its position relative to the external opening varies considerably according to the order or family. In the Orthoptera, Dermaptera, Odonata, Hemiptera, Neuroptera and Trichoptera it is formed from parts of the body wall which are slightly inflected inwards; in Mecoptera it lies still further inwards, while in Diptera it may be situated either directly behind the external opening or further inwards at the tracheal entrance after the intervention of an atrium. In Aphaniptera (Wigglesworth 1935) it surrounds the tracheal tube, some distance from its mouth in a region devoid of spiral thickenings. The abdominal spiracular apparatus itself consists of variously shaped elastic and non-elastic cuticular parts together with one or more muscles. The parts of the apparatus are usually maintained in position by the muscles of the body wall and by connective tissue.

As to the origin of the cuticular parts of the apparatus, Krancher (1881) maintained that in both simple and more complex closing apparatus the parts are local thickening of the spiral fibre of the trachea. That Krancher's hypothesis is erroneous can be proved by examination of a less differentiated spiracular apparatus such as that of the Orthoptera where the parts are clearly nothing more than invaginations of the body wall. Even in more evolved types of apparatus where a lever is present at the site of the opening, as is the cases in Mecoptera and Neuroptera, it can easily be seen that the lever and other cuticular parts are continuations of the inflected peritreme or similar sclerotized regions of the body wall. Passing on to yet more complex forms of apparatus where the lever is situated at the inner end of a well developed atrium, it can be seen that the same principle still holds. In Rhyphdae (Fig. 1), for example, the sclerotized lever is continuous with the bands which pass inwards from the cuticle or the peritremal sclerite, along the atrial wall. Even the so-called bridge, specifically mentioned by Krancher as formed of a number of fused tracheal spirals, can be seen in sections as well as in whole mounts, to be in fact a part of the sclerotized thickening of the atrial wall. The findings of Alt (1909) in *Dytiscus* and Mammen (1912) in Hemiptera are in agreement with the conclusions of the writer concerning the derivation of the parts of the regulatory apparatus from the integument.

As to the muscles of the spiracular system, although they vary considerably in size and mode of attachment in different families, yet with respect to the arrangement of the bundles they fall into two types : (a) those in

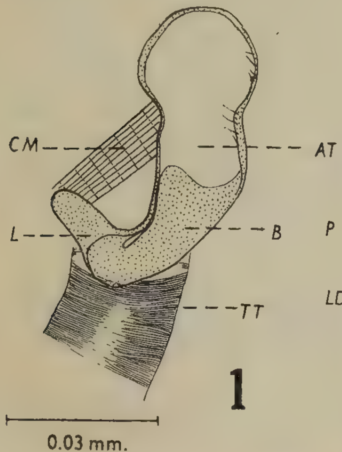
which the bundles are parallel, and (b) those in which the bundles radiate fan-wise from a centre.

In Orthoptera (Krancher 1881, and Snodgrass 1929), Odonata (Krancher 1881) and Hemiptera (Mammen 1912) the thoracic and abdominal muscles are of the same type, the bundles being parallel in Orthoptera and radiating in Odonata and Hemiptera.

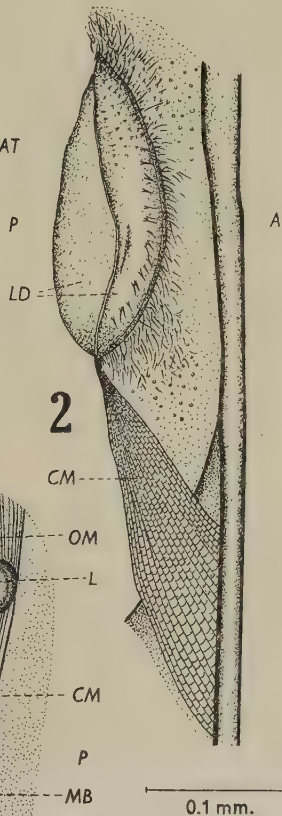
In the present investigation thoracic and abdominal muscles were found to differ. The thoracic spiracles of Mecoptera (Figs. 2 and 3) and Diptera (Fig. 4) usually have a fan-shaped muscle, while in the abdominal spiracles the bundles are more or less parallel. In the Neuroptera and Trichoptera, on the other hand, the anterior as well as the abdominal muscles are of the parallel-bundle type, having a spindle and semi-circular shape in the anterior thoracic and abdominal spiracles of Trichoptera respectively. The posterior thoracic spiracular muscles of the last two orders are of the radiate type. It was observed in the course of this work that regulatory muscles always originate in the segment containing the spiracle, and that when the closing muscle of the abdominal apparatus of *Chironomus dorsalis* is fully relaxed, it has the same appearance as those in its immediate neighbourhood. This suggests that the closing muscle of *Chironomus dorsalis* may be homologous with the lateral body wall muscles, but the points of attachment may have shifted on to the regulatory apparatus.

The above mentioned classification is applicable to all known types of Spiracular apparatus. It differs from that of Snodgrass (1929 and 1935) who distinguished two types of "closing apparatus," external (thoracic), in which the closure is accomplished by means of the outer "lips" of the atrium, and internal (abdominal) in which the passage from the atrium into the trachea is blocked. This scheme, however, takes no account of the fact that the mechanism is internal in certain types of thoracic regulatory apparatus, the parts being homologous in their portions relative to the external opening, with those of the abdominal apparatus of the lower Pterygota as well as of Mecoptera, Neuroptera and Trichoptera. In the case of *Melophagus ovina* L., indeed, the thoracic apparatus is situated still further from the surface and, as in the highly developed abdominal apparatus, regulates the diameter of the passage between the atrium and trachea. While in agreement with the distinction made by Snodgrass between two main categories of "closing apparatus," external and internal, the results of the present investigation show that these are not (as Snodgrass suggests) co-extensive with the categories thoracic and abdominal. The classification proposed by Mammen (1912) is based on a study of the muscles of the "closing apparatus," their number and the nature of their attachments. As already

remarked by Imms (1934) this author deals almost entirely with Hemiptera. In the light of the present work this classification appears of restricted utility.



1



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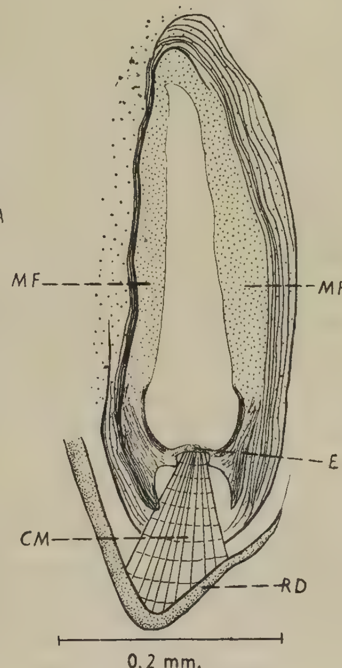

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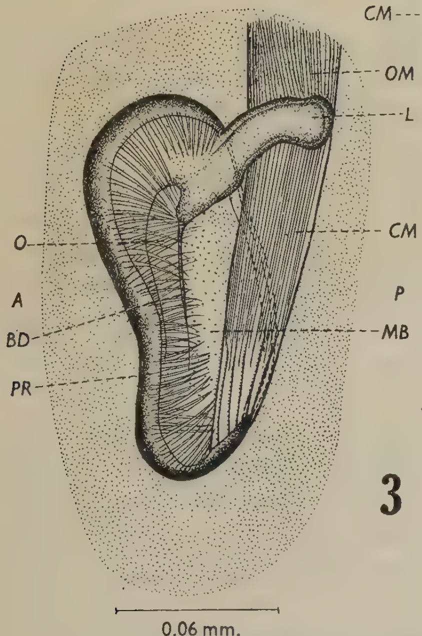

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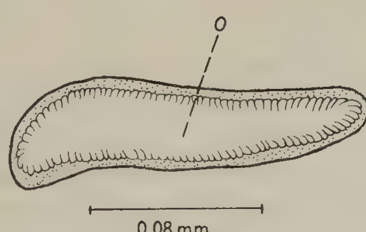

5

Fig. 1 : *Rhyphidae* (Diptera), lateral section of abdominal spiracle (*AT*, atrium; *B*, bridge; *CM*, closing muscle; *L*, lever; *TT*, tracheal tube). — Fig. 2 : *Panorpe communis* (Mecoptera), posterior thoracic spiracle, closed, internal view (*A*, anterior; *CM*, closing muscle; *LD*, lid; *P*, posterior). — Fig. 3 : *Panorpe communis* (Mecoptera), abdominal spiracle, internal view (*A*, anterior; *BD*, band; *CM*, closing muscle; *L*, lever; *MB*, membrane; *O*, spiracular opening; *OM*, opening muscle; *P*, posterior; *PR*, peritreme. — Fig. 4 : *Anthomyidae* (Diptera), internal view (*CM*, closing muscle; *E*, elastic plate; *MF*, membraneous flap; RD, ridge). — Fig. 5 : Thysanura, transversal section of abdominal spiracle (*O*, opening).

Although thoracic and abdominal apparatus often differ markedly in their structure and mechanism, it is possible to demonstrate that both may have been derived from a common prototype prevalent among those animals from which the Apterygota may have been arisen and that later in the process of evolution the abdominal apparatus may have diverged from the thoracic. As the thoracic and abdominal stigmata of Onychophora, Myriapoda and Thysanura are simple slits in the body wall with no provision for regulating the size of the opening, it is not unreasonable to suppose that, when it first made its appearance, the spiracular apparatus of the abdominal spiracles was similar to that of the thoracic one. Evidence of this is provided by the following facts :

(1) In the larval stages of Lepidoptera (Krancher 1881, and Snodgrass 1929) and other larvae (Snodgrass 1929), regulatory apparatus is the same in both types of stigmata.

(2) Among adult stages, the abdominal apparatus is the same as the thoracic in Thysanura and other Apterygota (Fig. 5) and in Odonata (Krancher 1881).

(3) The divergence between the abdominal and thoracic spiracles is least marked in these insects which on other grounds are regarded as most generalized. Thus, in the Orthoptera, for example, where the thoracic apparatus appears to be primitive, the two are essentially the same. The main difference is that in the thoracic spiracle the body wall bulges outwards whereas in the abdominal type it is slightly invaginated. In both cases the same integumental parts form the spiracular apparatus. The description and figures given by Krancher (1881), Vinal (1919) and Snodgrass (1929) for Orthoptera, as well as the results of Mammen (1912) on Hemiptera and those of the present work on Mecoptera, Trichoptera and Neuroptera point without doubt to this conclusion.

(4) Moreover, in many forms especially most primitive ones, the mechanism for regulating the stigmatic opening is essentially the same in both types of stigmata : in the anterior thoracic as well as the abdominal spiracles of Orthoptera, for example, one part of the body wall is movable while the other is rigid. The closing muscle has its attachment on a process of the movable lobe and by its contraction draws this against the opposite rigid lobe, thus closing the aperture between them. Opening is accomplished by contraction of an opening muscle, and simultaneous relaxation of a closing muscle. The same mechanical principle is encountered in the Hemiptera (Mammen 1912) where in both thoracic and abdominal spiracles the movable part of the stigmatic rim is drawn against the rigid portion by means of a closing muscle attached to a process at the base of the movable thoracic or abdominal lobe, whereas opening is accomplished through the elasticity

of the movable lobe. In the abdominal apparatus, the above mentioned process is more elongated and more rigid than that of the thoracic and assumes a conical shape which perhaps affords a better attachment for the closing muscle. The more complex types of abdominal apparatus may have arisen in some such way as this by progressive modification of the simple type. Conceivably the increased development of the muscle itself has led to the production of the more effective levers and other similar parts found in the higher forms, since muscle tension may well be responsible for the development of apodemes and other skeletal structures in the region where the muscle is inserted into the cuticle (Wigglesworth 1939).

(5) Finally, the function of the thoracic and abdominal spiracular system may be the same as shown by Lee (1925 and 1927) and others in Orthoptera where the first four spiracles (the thoracic and the first two abdominals) are inspiratory.

CORRIGENDA

zu "Die Microlepidopteren der Brandt'schen Iran-Ausbeute, I. Teil"

von Dr. H. G. Amsel

(*Bull. Soc. Fouad Ier Entom.*, XXXIII, 1949, pp. 227-269)

Seite 228, zeile 4 : *statt* genüngender *lies* genügender.

Seite 228, zeile 19 : *statt* Zurdem *lies* Zudem.

Seite 228, zeile 21 : *statt* (Kairo *lies* (Kairo).

Seite 229, zeile 2 : *statt* Enthält *lies* enthält.

Seite 230, zeilen 20 und 21 : *statt* sind zu streichen.

Seite 232, zeile 10 : *statt* 1 *lies* 11.

Seite 232, zeile 37 : *statt* unfangrei *lies* umfangrei-.

Seite 233, zeile 4 : *statt* nuen *lies* neuen.

Seite 235, zeile 11 : *statt* der inneren Seite ist am Irand deutlich breiter als nach oben, in der *lies* gelbe Mitttelbinde grade, braünlich eingefasst, wobei die Einfassung auf der.

Seite 235, zeile 13 : *statt* Imrand *lies* Irand.

Seite 236, zeile 12 : *statt* Augendurchmesser an *lies* Augendurchmesser, an.

Seite 236, zeile 15 : *statt* Männchen *lies* Männchens.

Seite 236, zeile 22 : *statt* diese aus *lies* dies Art aus.

Seite 236, zeile 37 : *statt* Bräunlich *lies* bräunlich.

Seite 236, zeile 40 : *statt* stammt da *lies* stammt, da.

Seite 237, zeile 29 : *statt* schreitb *lies* schreibt.

Seite 238, zeile 37 : *statt* angeschen *lies* angesehen.

Seite 241, zeile 20 : *statt* vom Zerny *lies* von Zerny.

Seite 241, zeile 21 : *statt* sowei *lies* sowie.

Seite 242, zeile 4 : *statt* Hfgl. bei *lies* Hfgl. sitzt bei.

Seite 242, zeile 35 : *statt* kräftige *lies* kräftig.

Seite 243, zeile 24 : *statt* Querlinien *lies* Querlinie.

Seite 243, zeile 37 : *statt* Querbinden *lies* Querbinde.

Seite 245, zeile 28 : *statt* Myelois *lies* Euzophera.

Seite 250, zeile 34 : *statt* 1911 *lies* 1901.

Seite 251, zeile 14 : *statt* nachgewwiesen *lies* nachgewiesen.

Seite 251, zeile 29 : *statt* fig. 23 u. 23a *lies* fig. 22 u. 23.

Seite 252, zeile 28 : *statt* ist ihrem *lies* ist in ihrem.

Seite 254, zeile 10 : *statt* Iran *lies* Irand.
Seite 254, zeile 11 : *statt* dei *lies* die.
Seite 254, zeile 17 : *statt* charakterische *lies* charakteristische
Seite 255, zeile 37 : *statt* Wurzle *lies* Wurzel.
Seite 256, zeile 25 : *statt* 2a *lies* 29a.
Seite 256, zeile 36 : statt *Grosse* lies *Grösse.*
Seite 258, zeile 19 : *statt* schmal Vinculum *lies* schmall, Vinculum
Seite 260, zeile 15 : *statt* beigten *lies* zeigten.
Seite 264, zeile 7 : *statt* Hercegorina *lies* Hercegovina.
Seite 268, zeile 4 : statt *poliopastalis* lies *canifusalis.*

CORRIGENDA

to "On the Microlepidoptera collected by E.P. Wiltshire in Irak and Iran in the years 1935 to 1938"

by Dr. H.G. Amsel

(*Bull. Soc. Fouad Ier Entom.*, XXXIII, 1949, pp. 271-351)

Page 272, line 32 : *for* entirely *read* entirety.
Page 276, line 3 : for *Pisstogenes* read *Pistogenes*.
Page 282, line 19 : *for* kerbella *read* kerbelella.
Page 290, line 7 : for *fractilieella* read *fractilineella*.
Page 298, line 22 : *for* mencidalis *read* mendicalis.
Page 298, line 24 : *for* Cybolomia *read* Cybalomia.
Page 298, line 24 : *for* Cybolomia *read* Cybalomia.
Page 299, line 1 : *for* Cybolomia *read* Cybalomia.
Page 300, line 29 : *for* poliopastalis *read* canifusalis.
Page 300, line 35 : *for* Dattinia *read* Constantia.
Page 302, line 34 : *for* licarsicalis *read* licarsisalis.
Page 323, line 3 : *for* 3000 *read* 300.
Page 340, line 8 : for *Cybolomia* read *Cybalomia*.
Page 350, line 12 : for *Cybolomia* read *Cybalomia*.
Page 350, line 13 : for *Cybolomia* read *Cybalomia*.
Page 350, line 15 : for *leucogrossa* read *leucocrossa*.
Page 350, line 20 : *for* Mas. *read* Ams.

ADDENDUM and CORRIGENDA

to "The Lepidoptera of the Kingdom of Egypt, Part II"

by E.P. Wiltshire

(*Bull. Soc. Fouad Ier Entom.*, XXXIII, 1949, pp. 381-460)

Page 381, line 22 : *for* W.M.T. Tams *read* W.H.T. Tams.

Page 386, line 35 : *for* by *read* the.

Page 387, line 9 : *for* Hesperidae *read* Hesperiidae.

Page 387, line 10 : *for* Hesperidae *read* Hesperiidae.

Page 390, after line 29 add : Dr. E. Berio has published in *Ann. Mus. Civ. Storia Nat. Genova*, LXIV (March 1950) a drawing (fig. 61) of the male genitalia of an *Ozarba* species which agrees with those of *fuscescens* Rebel 1948. Dr. Berio however there calls this figure *Ozarba phaea* Hamps. His figure, loc. cit., of *flavidiscata* Hamps. does not agree with *fuscescens* Rebel genitalia.

Page 395, line 2 : *for* 76 *read* 74.

Page 401, line 13 : *for* and *read* are.

Page 406, line 9 : *for* 94 *read* 97.

Page 406, line 13 : the parentheses should come in the next line, after the word "genitalia."

Page 410, line 38 : *for* No. 281 *read* No. 282.

Page 412, line 36 : *for* it *read* is.

Page 419, line 36 : *for* a *read* is.

Page 431, line 19 : *for* Walk. *read* Watk.

Page 432, line 7 : *for* habylaria *read* kabylaria.

Page 433, line 36 : *for* geographical *read* ecological.

Page 435, line 18 : *for* whoe *read* whole.

Page 439, line 20 : *for* the *read* that.

BULLETIN

DE LA

SOCIÉTÉ FOUAD Ier D'ENTOMOLOGIE

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DU

TRENTE-QUATRIÈME VOLUNE

1950

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Pour la correspondance administrative et scientifique, échanges de Publications, changement d'adresse et réclamations, s'adresser à Monsieur le Secrétaire Général de la Société Fouad Ier d'Entomologie, Boîte Postale N° 430, Le Caire.

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